Microbiology Master File

1. Lipopolysaccharide is an important component of Gram negative cell wall. What is the composition of LPS, from inside to out?

a. Fatty acids, core, polycaccharide, O antigen
b. Lipid A, core polysaccharide, outer polysaccharide of repeating sugar units
c. Core polysaccharide, outer polysaccharide of repeating sugar units, Lipid A
d. O antigen, techoic acid, core, polycaccharide
e. Fatty acids, core, outer polysaccharide of repeating sugar units, techoic acid
Key b

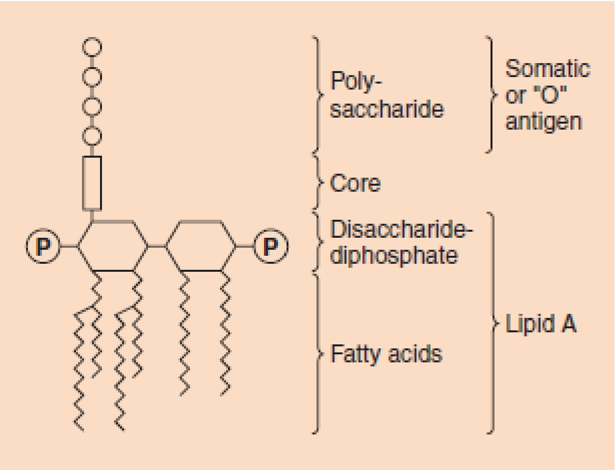


FIGURE 2–6 Endotoxin (lipopolysaccharide [LPS]) structure. The O-antigen polysaccharide is exposed on the exterior of the cell, whereas the lipid A faces the interior. (Reproduced with permission from Brooks GF et al. *Medical Microbiology.* 19th ed. Originally published by Appleton & Lange. Copyright 1991, McGraw-Hill.)

2. Bacteroides fragilis is a major part of normal stool flora. What is its approximate number in a gram of feces?

a. 1012-1013
b. 1011-1012
c. 108-109
d. 100-1010
e. 106-107
Key c (correct option would be 10 ^10 – 10 ^11)

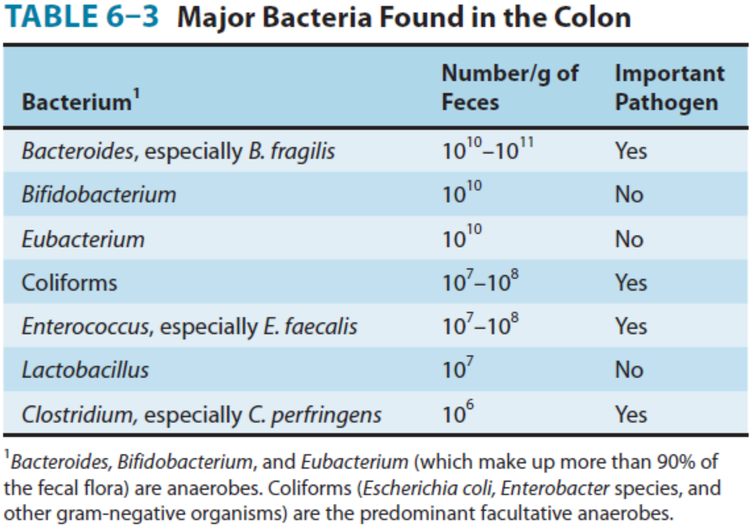


TABLE 6–3 Major Bacteria Found in the Colon

Bacterium[1]	Number/g of Feces	Important Pathogen
Bacteroides, especially *B. fragilis*	10^{10}–10^{11}	Yes
Bifidobacterium	10^{10}	No
Eubacterium	10^{10}	No
Coliforms	10^{7}–10^{8}	Yes
Enterococcus, especially *E. faecalis*	10^{7}–10^{8}	Yes
Lactobacillus	10^{7}	No
Clostridium, especially *C. perfringens*	10^{6}	Yes

[1] *Bacteroides*, *Bifidobacterium*, and *Eubacterium* (which make up more than 90% of the fecal flora) are anaerobes. Coliforms (*Escherichia coli*, *Enterobacter* species, and other gram-negative organisms) are the predominant facultative anaerobes.

3. Which exotoxin is a protease?
a. Diphtheria toxin
b. Pertussis toxin
c. Clostridium perfringens alpha toxin
d. Botulinum toxin
e. Staphylococcal enterotoxin
Key d

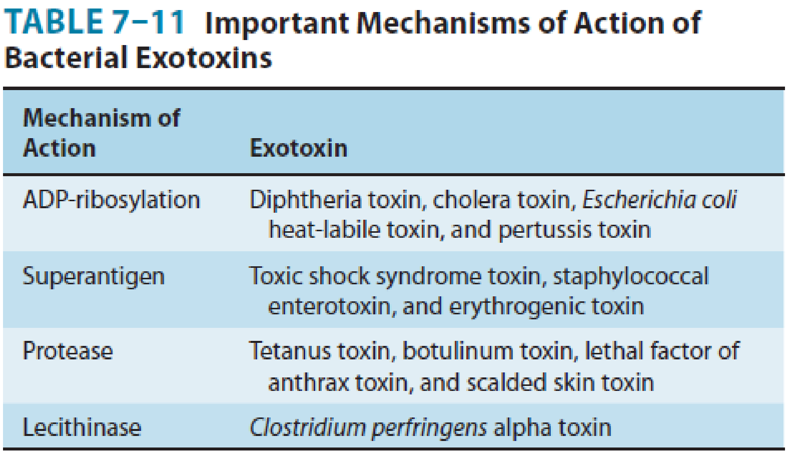
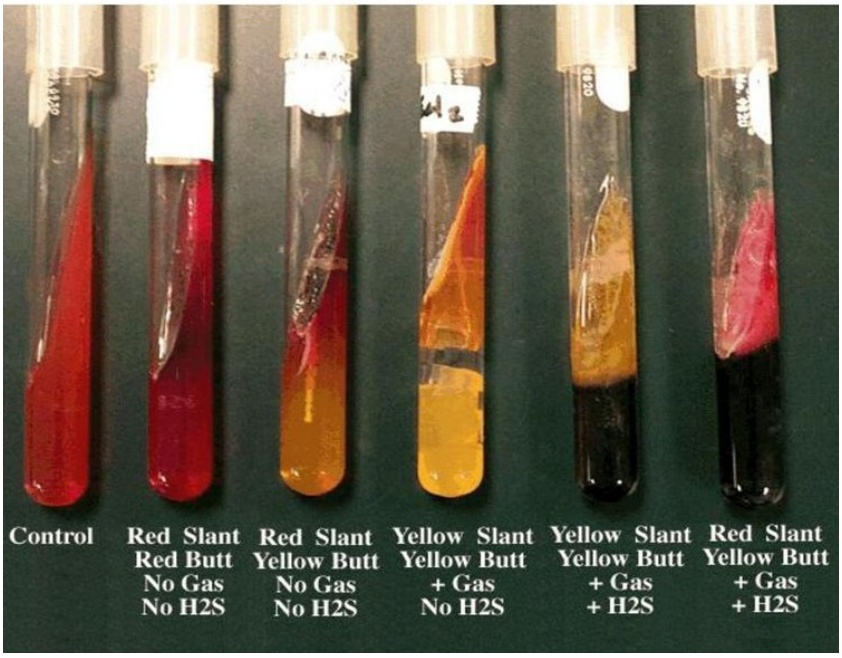


TABLE 7–11 Important Mechanisms of Action of Bacterial Exotoxins

Mechanism of Action	Exotoxin
ADP-ribosylation	Diphtheria toxin, cholera toxin, *Escherichia coli* heat-labile toxin, and pertussis toxin
Superantigen	Toxic shock syndrome toxin, staphylococcal enterotoxin, and erythrogenic toxin
Protease	Tetanus toxin, botulinum toxin, lethal factor of anthrax toxin, and scalded skin toxin
Lecithinase	*Clostridium perfringens* alpha toxin

4. An isolate was applied on TSI agar. The result yielded a pink coloured slant and yellow butt. The isolate would most likely be: -
a. Escherichia coli
b. Pseudomonas aeruginosa
c. Salmonella Typhi
d. Shigella spp
e. Klebsiella pneumoniae
Key d


Control
Red Slant Red Butt No Gas No H2S
Red Slant Yellow Butt No Gas No H2S
Yellow Slant Yellow Butt + Gas No H2S
Yellow Slant Yellow Butt + Gas + H2S
Red Slant Yellow Butt + Gas + H2S

5. Animal vectors serve as important means of disease transmission for many diseases. Mosquitoes, ticks and flies are important vectors for disease transmission. Which disease is not transmitted by tick bite?
a. Q fever
b. Rocky Mountain spotted fever
c. Lyme disease
d. Anaplasmosis
e. Ehrlichiosis
Key a

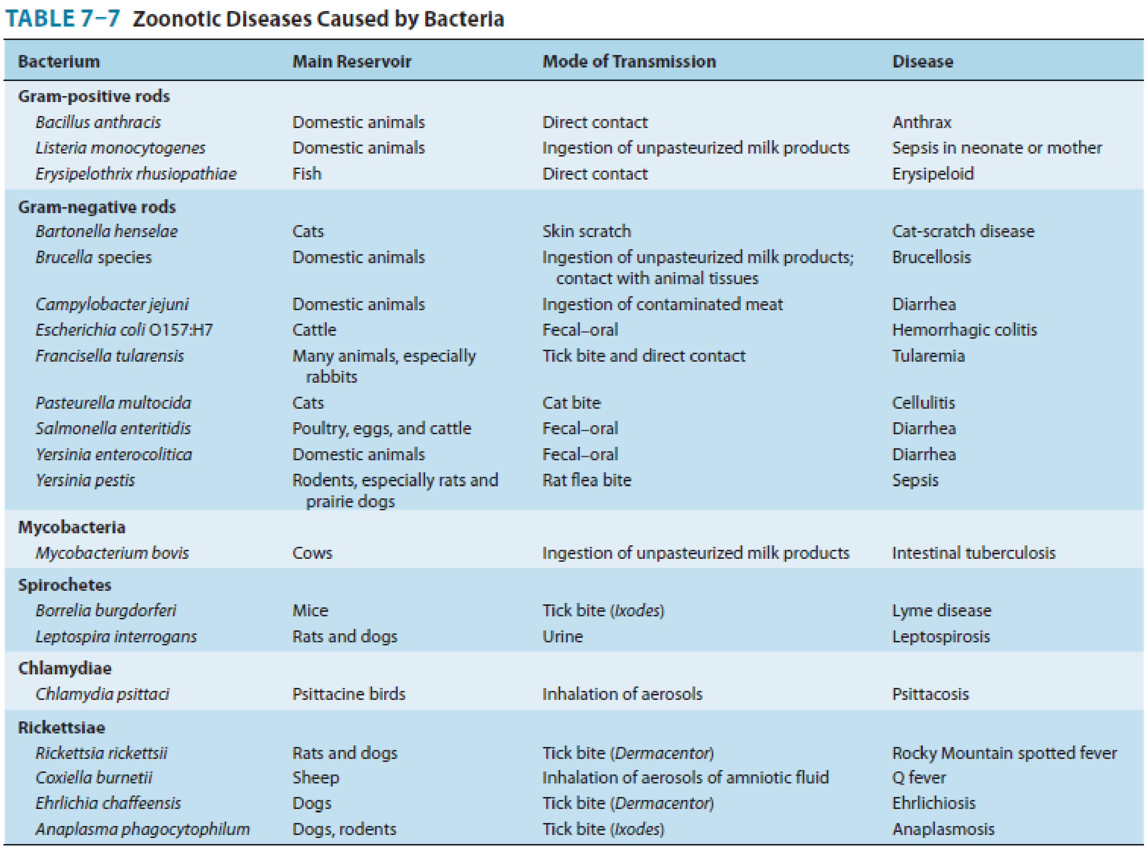


TABLE 7–7 Zoonotic Diseases Caused by Bacteria

Bacterium	Main Reservoir	Mode of Transmission	Disease
Gram-positive rods			
Bacillus anthracis	Domestic animals	Direct contact	Anthrax
Listeria monocytogenes	Domestic animals	Ingestion of unpasteurized milk products	Sepsis in neonate or mother
Erysipelothrix rhusiopathiae	Fish	Direct contact	Erysipeloid
Gram-negative rods			
Bartonella henselae	Cats	Skin scratch	Cat-scratch disease
Brucella species	Domestic animals	Ingestion of unpasteurized milk products; contact with animal tissues	Brucellosis
Campylobacter jejuni	Domestic animals	Ingestion of contaminated meat	Diarrhea
Escherichia coli O157:H7	Cattle	Fecal–oral	Hemorrhagic colitis
Francisella tularensis	Many animals, especially rabbits	Tick bite and direct contact	Tularemia
Pasteurella multocida	Cats	Cat bite	Cellulitis
Salmonella enteritidis	Poultry, eggs, and cattle	Fecal–oral	Diarrhea
Yersinia enterocolitica	Domestic animals	Fecal–oral	Diarrhea
Yersinia pestis	Rodents, especially rats and prairie dogs	Rat flea bite	Sepsis
Mycobacteria			
Mycobacterium bovis	Cows	Ingestion of unpasteurized milk products	Intestinal tuberculosis
Spirochetes			
Borrelia burgdorferi	Mice	Tick bite (*Ixodes*)	Lyme disease
Leptospira interrogans	Rats and dogs	Urine	Leptospirosis
Chlamydiae			
Chlamydia psittaci	Psittacine birds	Inhalation of aerosols	Psittacosis
Rickettsiae			
Rickettsia rickettsii	Rats and dogs	Tick bite (*Dermacentor*)	Rocky Mountain spotted fever
Coxiella burnetii	Sheep	Inhalation of aerosols of amniotic fluid	Q fever
Ehrlichia chaffeensis	Dogs	Tick bite (*Dermacentor*)	Ehrlichiosis
Anaplasma phagocytophilum	Dogs, rodents	Tick bite (*Ixodes*)	Anaplasmosis

6. A 2 years' child was brought by parents with history of repeated infections. The paediatrician suspected an immunological disorder that was ultimately diagnosed as Chronic Granulomatous disease. The main defect in this disease is:

a. Abnormal lysosomal granules that cannot fuse with phagosome
b. Myeloperoxidase deficiency
c. Superoxide dismutase deficiency
d. Neutropenia
e. Defect in NADPH oxidase and failure to generate Hydrogen peroxide

Key e

7. Which of the Staphylococcus species are clumping factor positive as demonstrated positivity of slide coagulase?

a. Staphylococcus aureus and Staphylococcus lugdunensis
b. Staphylococcus aureus and Staphylococcus epidermidis
c. Staphylococcus aureus and Staphylococcus capitis
d. Staphylococcus aureus and Staphylococcus saprophyticus
e. Staphylococcus aureus and Staphylococcus hominis

Key a

Organism	**Slide Coagulase**	**Tube Coagulase**
S. aureus	**+**	**+**
S. schleiferi	**+**	**-**
S. lugdunensis	**+**	**-**
S. anaerobius	**-**	**+**

8. Which is an important virulence factor in the pathogenesis of Staphylococcus epidermidis?

a. Superoxide dismutase
b. Biofilm formation
c. Hyaluronidase
d. Alpha toxin
e. Catalase

Key b

9. There is an MRSA outbreak in the operation theatre of your hospital. You are requested to check for MRSA carriers among your hospital staff. Which sample will you take?

a. Pus swab
b. Axillary swab
c. Perineal swab
d. Nasal swab
e. Web swab

Key d

10. A 60 years old diabetic patient developed prolong fever after a dental extraction. Subacute bacterial endocarditis was suspected. You receive two sets of his paired blood cultures. Which organism is likely to be isolated?

a. Enterococcus faecalis
b. Viridans Streptococci
c. Streptococcus group B
d. Streptococcus pyogenes
e. Streptococcus group C

Key b

11. Which species is intrinsically resistant to vancomycin?

a. Enterococcus faecalis
b. Enterococcus faecium
c. Enterococcus gallinarum
d. Enterococcus durans
e. Streptococcus bovis

Key c

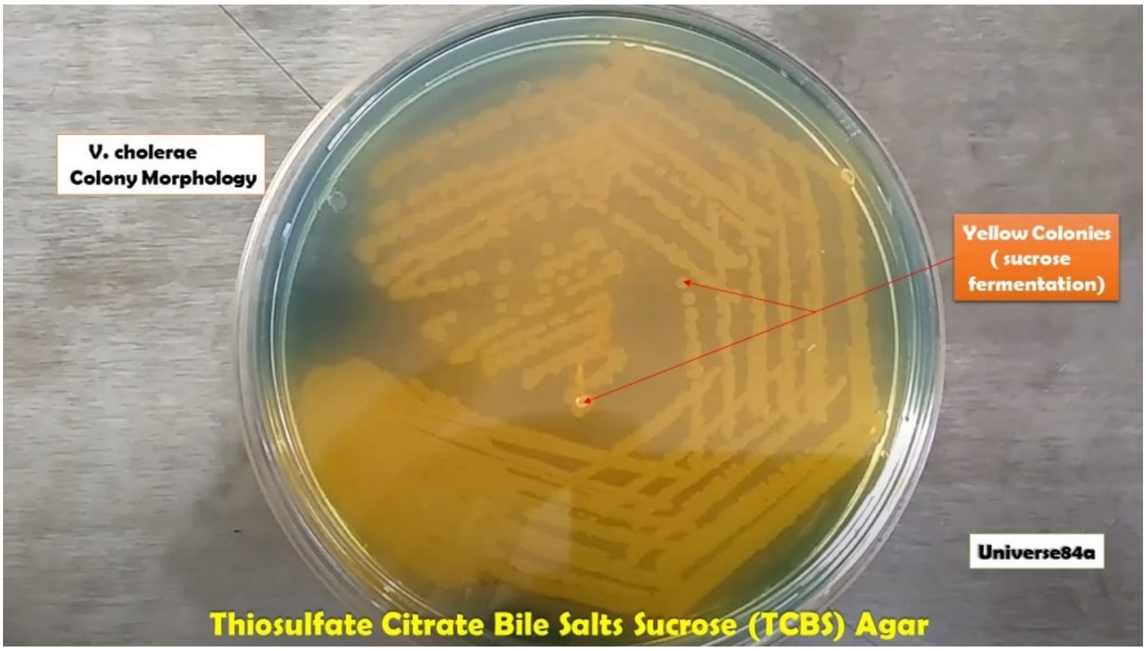
Note: Some species of enterococcus are intrinsically resistant to vancomycin, including E. gallinarum and E. casseliflavus. These species are also known as VanC enterococci :)

12. An isolate gave yellow colonies on TCBS agar. It is most likely:

a. Pseudomonas aeruginosa
b. Escherichia coli
c. Vibrio cholerae
d. Salmonella Typhi
e. Neisseria gonorrhoeae

Key c

Morphology	**Bacteria**
Yellow	**Vibrio cholerae** **Vibrio alginolyticus** **(jisnay "CA" kia usko yellow star mila)**
Green/Colourless	**Vibrio parahemolyticus** **Vibrio vulnificus** **Vibrio mimicus** **("PV"" discharge is green) MVP**



13. A six months old baby was brought by his parents who wanted to vaccinate him against Salmonella Typhi due to the fear of XDR Salmonella Typhi. Which vaccination would you advise them?

a. Oral, live attenuated Salmonella vaccine
b. Inactivated Typhoid vaccine, intramuscular
c. Polysaccharide capsule vaccine conjugated to tetanus toxoid
d. TAB vaccine
e. Any of these could be administered

Key c

The Typhoid Conjugate Vaccine (TCV) is the only typhoid vaccine approved for infants as young as 6 months because it overcomes the limitations of immature immune systems. Unlike older polysaccharide vaccines, TCV links the Vi polysaccharide antigen to a protein carrier (e.g., tetanus toxoid), which activates T-helper cells, induces a strong and lasting immune response, and provides immunological memory for prolonged protection.

14. Which organism needs anaerobic conditions for growth?

a. Bacillus cereus
b. Clostridium tetani
c. Corynebacterium diphtheria
d. Corynebacterium ulcerans
e. Listeria monocytogenes

Key b

15. Exotoxins are not important pathogenic mechanism for many Gram positive organisms. Exotoxins are not important in the pathogenesis of which organism?

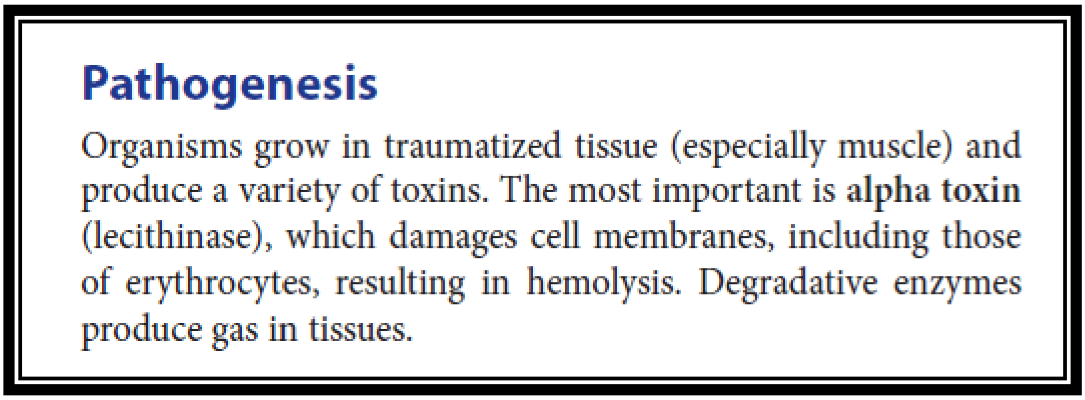
a. Bacillus anthracis
b. Clostridium tetani
c. Corynebacterium diphtheria
d. Staphylococcus aureus
e. Listeria monocytogenes

Key e

16. A soldier who was a victim of mine blast injury suffered extensive trauma to right lower limb. The wound was seen to be badly contaminated with soil. After two days, his foot became black, with multiple blisters and a crepitus could be felt on palpation. The most important virulence factor of the likely organism is:

a. Alpha toxin
b. Beta toxin
c. Gamma toxin
d. Epsilon toxin
e. DNAse

Key a



Pathogenesis

Organisms grow in traumatized tissue (especially muscle) and produce a variety of toxins. The most important is **alpha toxin** (lecithinase), which damages cell membranes, including those of erythrocytes, resulting in hemolysis. Degradative enzymes produce gas in tissues.

17. Regarding the virulence factor in the previous question, it is actually a:

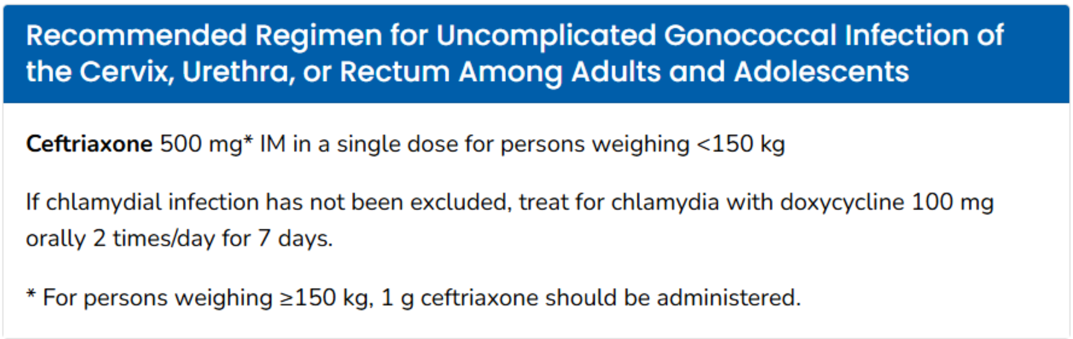
a. Lecithinase
b. Collagenase
c. Hyaluronidase
d. Protease
e. DNAse
Key a

18. Meningococcal meningitis is a life-threatening infection but vaccine provides good prevention against this serious disease. Which serogroup is not covered in the capsular polysaccharide vaccine commonly used?

a. A
b. B
c. C
d. Y
e. W-135
Key b

19. The treatment of choice for gonococcal urethritis is:

a. Ceftriaxone 250mg IM stat plus Azithromycin 1g po stat
b. Ceftriaxone 200mg IM stat plus Azithromycin 1g po stat
c. Meropenem 500mg IM stat plus Azithromycin 1g po stat
d. Meropenem 1000mg IM stat plus Azithromycin 1g po stat
e. Ceftriaxone 250mg IM stat plus Azithromycin 2g po stat
Key a

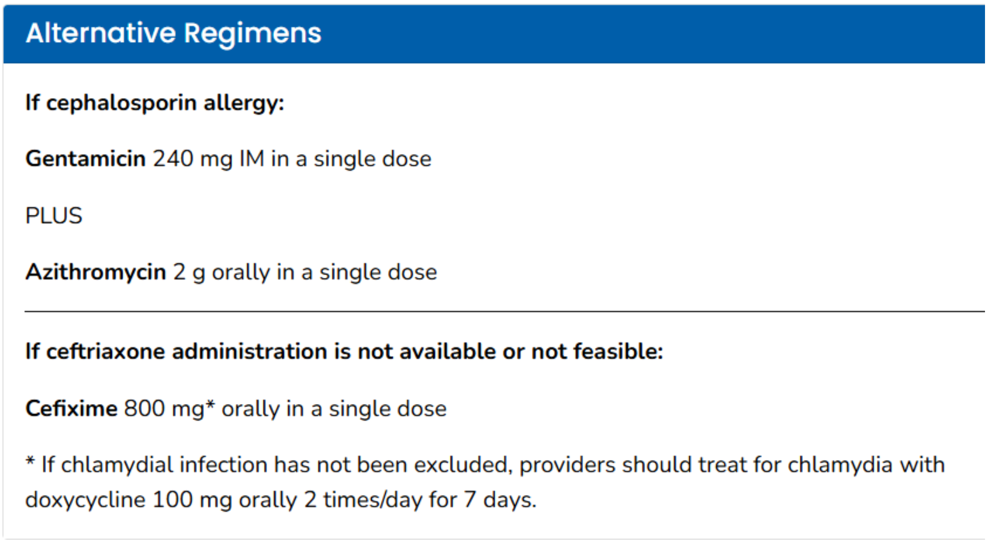


Recommended Regimen for Uncomplicated Gonococcal Infection of the Cervix, Urethra, or Rectum Among Adults and Adolescents

Ceftriaxone 500 mg* IM in a single dose for persons weighing <150 kg

If chlamydial infection has not been excluded, treat for chlamydia with doxycycline 100 mg orally 2 times/day for 7 days.

* For persons weighing ≥150 kg, 1 g ceftriaxone should be administered.



Alternative Regimens

If cephalosporin allergy:

Gentamicin 240 mg IM in a single dose

PLUS

Azithromycin 2 g orally in a single dose

If ceftriaxone administration is not available or not feasible:

Cefixime 800 mg* orally in a single dose

* If chlamydial infection has not been excluded, providers should treat for chlamydia with doxycycline 100 mg orally 2 times/day for 7 days.

20. Penicillin was the pioneer antibiotic that saved lives of many, especially in world war II. However, soon afterwards, many bacteria started to develop resistance against penicillin. Nowadays, almost all bacteria have become resistant to penicillin. Which organism has still not developed resistance to penicillin?

a. Staphylococcus aureus
b. Streptococcus pneumoniae
c. Kingella kingae
d. Treponema pallidum
e. Rickettsia rickettsii
Key d

STREPTOCOCCUS PYOGENES AND TREPONEMA PALLIDUM HAVE NEVER DEVELOPED RESISTANCE TO PENICILLIN

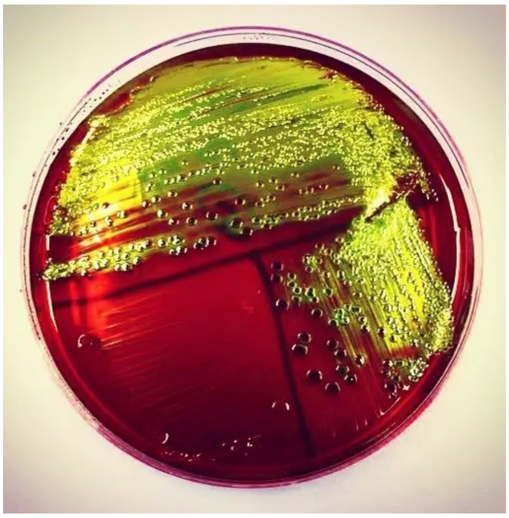
21. Campylobacter jejuni is a frequent cause of enterocolitis. What are the growth requirements of Campylobacter jejuni?

a. 35°C, ambient air
b. 35°C, microaerophilic environment
c. 35°C, capnophilic environment
d. 42°C, ambient air
e. 42°C, microaerophilic and capnophilic environment
Key e

22. The infective dose of Shigella dysenteriae is:

a. 1 organism
b. 10 organisms
c. 100 organisms
d. 1000 organisms
e. 10000 organisms
Key c

Very favourite! Salmonella 10^5 and Shigella 10^2



23. A 2 days old baby is presented with fever and poor feeding. The pediatrician is suspecting neonatal meningitisand sepsis. You receive his CSF for culture. Pure, heavy growth of a single morphotype of colonies is yielded,the next day. As a 1st year registrar, you subculture the colonies on EMB agar out of your inquisitive nature. The colonies give a characteristic green sheen. The isolate is likely:

a. Escherichia coli
b. Acinetobacter baumannii
c. Streptococcus agalactiae
d. Listeria monocytogenes
e. Pseudomonas aeruginosa
Key a

24. Regarding Pseudomonas aeruginosa, which drugs, according to the latest CLSI guidelines, are primarily tested and reported?
  a. Amikacin
  b. Ceftazidime
  c. Piperacillin-tazobactam
  d. Tobramycin
  e. Imipenem-cilastatin
  Key c

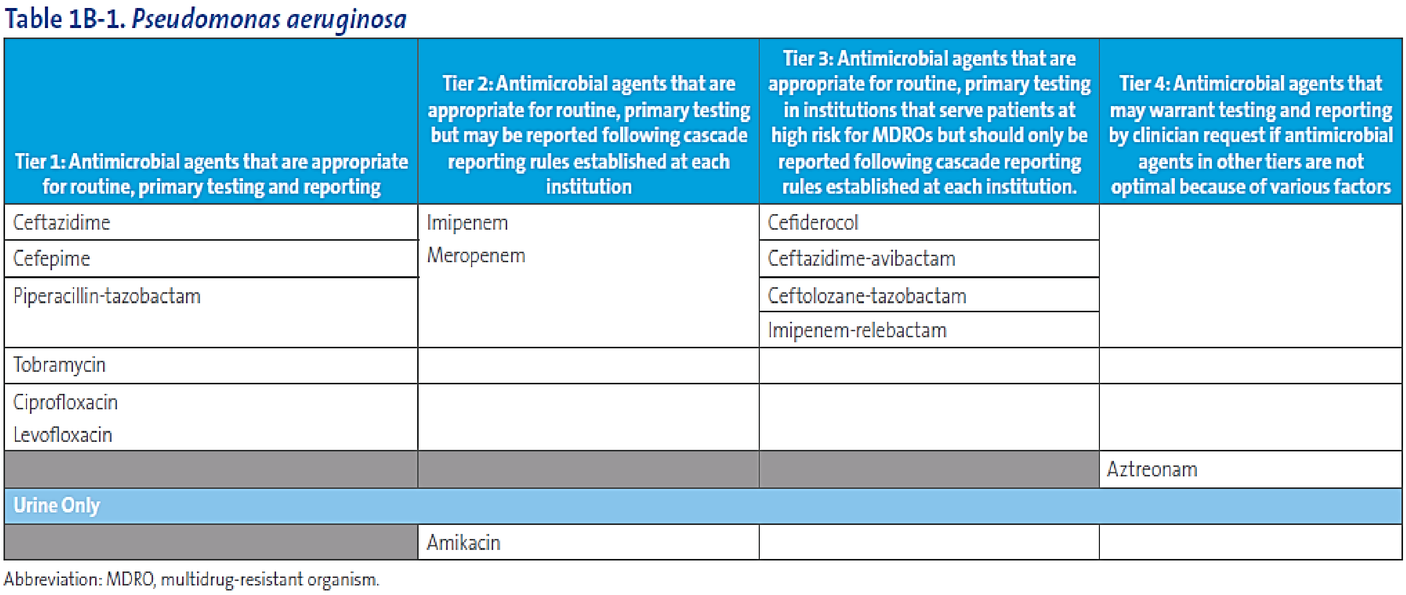


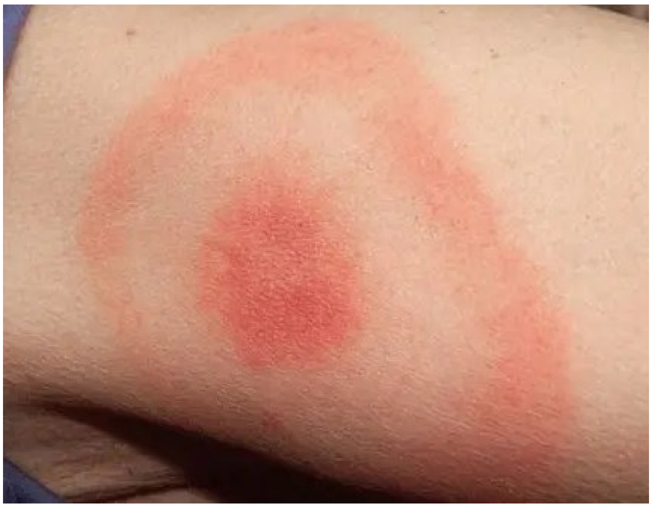
Table 1B-1. *Pseudomonas aeruginosa*

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution.	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ceftazidime	Imipenem	Cefiderocol	
Cefepime	Meropenem	Ceftazidime-avibactam	
Piperacillin-tazobactam		Ceftolozane-tazobactam	
		Imipenem-relebactam	
Tobramycin			
Ciprofloxacin Levofloxacin			
			Aztreonam
Urine Only			
	Amikacin		

Abbreviation: MDRO, multidrug-resistant organism.

25. You receive urine for culture and sensitivity. It yielded growth of non-lactose fermenting colonies. However, ONPG is positive next day, on api10s. The isolate is most likely:
  a. Citrobacter freundii
  b. Klebsiella pneumoniae
  c. Proteus mirabilis
  d. Pseudomonas aeruginosa
  e. Morganella morganii
  Key a

26. A 29 years old male was fond of hiking and camping, especially during summers. A week after his return from a hiking trip, he developed fever, myalgias, arthralgias, and headache. On examination, the clinician noted a circular, expanding, erythematous macular rash on one of his arms. The most likely diagnosis would be:
  a. Ehrlichiosis
  b. Rocky Mountain spotted fever
  c. Q fever
  d. Anaplasmosis
  e. Lyme disease
  Key e



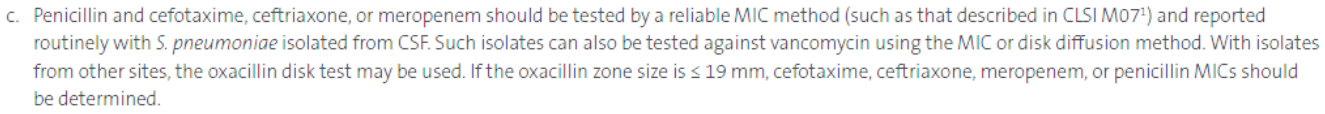
27. A 70-year-old diabetic lady was undergoing hemodialysis. She was having episodes of fever for 2 days after dialysis sessions. Paired blood taken from double lumen catheters and peripheral lines yielded growth of a similar isolate. The double lumen catheter can be salvaged by antibiotic lock therapy in case of which isolate:
  a. Staphylococcus epidermidis

b. Staphylococcus aureus
c. Candida albicans
d. Candida glabrata
e. Acinetobacter baumannii
Key a

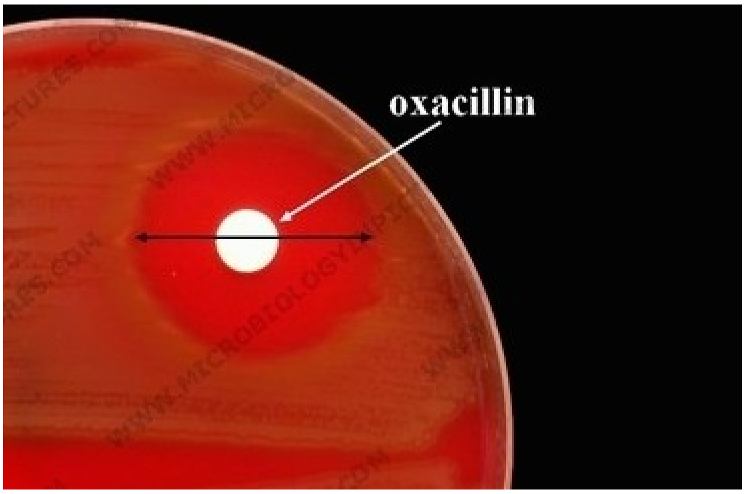
28. A 12-year-old patient of AML, admitted in the oncology ward, developed a black patch on her palate. A sample was taken from the patch, and its direct microscopy revealed broad hyphae with right-angle branching. Which empirical antimicrobial would you advise to be added?
a. Amphotericin-B
b. Voriconazole
c. Posaconazole
d. Caspofungin
e. Fluconazole
Key a

Feature	**Aspergillus**	**Mucor**
Hyphae	**Narrow, Septate**	**Broad ribbon like**
Branching pattern	**Regular, acute angle 45 degrees**	**Irregular, Wide angle 90 degrees**
Septa	**SEPTATE**	**ASEPTATE (better to say sparsely septate)**
Hints	**Post-tuberculosis**	**Diabetic Immunocompromised Neutropenic BLACK FUNGUS**
Disease	**Pulmonary aspergillosis, aspergilloma, allergic bronchopulmonary aspergillosis (ABPA)**	**Rhinocerebral mucormycosis, pulmonary mucormycosis**
Treatment	**Voriconazole**	**Amphotericin B THIS IS AN EMERGENCY!**

29. A 50-year-old lady presented with fever and cough. Her sputum sample was received for culture that yielded alpha-hemolytic colonies on blood agar plate. The next day, its sensitivity applied on blood agar showed a zone of 19 mm around the oxacillin disc. It should be reported as:
a. Penicillin and ceftriaxone sensitive
b. Ceftriaxone sensitive but penicillin resistant
c. Meropenem sensitive but perform MIC for penicillin and ceftriaxone
d. Penicillin resistant, however perform MIC for ceftriaxone
e. Penicillin can be sensitive, intermediate or resistant; perform penicillin MIC
Key e



c. Penicillin and cefotaxime, ceftriaxone, or meropenem should be tested by a reliable MIC method (such as that described in CLSI M07[1]) and reported routinely with *S. pneumoniae* isolated from CSF. Such isolates can also be tested against vancomycin using the MIC or disk diffusion method. With isolates from other sites, the oxacillin disk test may be used. If the oxacillin zone size is ≤ 19 mm, cefotaxime, ceftriaxone, meropenem, or penicillin MICs should be determined.



30. A butcher presented with high-grade fever and petechial rash all over his body. CCHF was suspected and was later confirmed by serology. You receive his blood sample for CBC. Which biosafety level is needed to perform it?

a. BSL-1
b. BSL-2
c. BSL-3
d. BSL-4
e. BSL-5
Key b CONTROVERSIAL BUT KEY IS CORRECT. FOR CBC BSL 2 BUT FOR VIRAL CULTURE/VIRUS ISOLATION BSL 4 (ref maj adnan)

31. A 4 days old baby, delivered by SVD, was brought with fever and poor feeding. The pediatrician suspected neonatal meningitis and sepsis. You received his CSF for culture that yielded pure, heavy growth of a single morphotype of a gram positive isolate. Which action could have prevented this?

a. Intrapartum prophylaxis with IV penicillin G
b. Intrapartum prophylaxis with IV cephradine
c. Intrapartum prophylaxis with IV ceftriaxone
d. Intrapartum prophylaxis with IV vancomycin
e. Intrapartum prophylaxis with IV cefazolin
Key a (they are talking about Group B Streptococcus i.e. Streptococcus agalactiae)

32. A 35 years old patient in bone marrow transplant ward was having fever after a week of transplant. He was being given broad spectrum antimicrobials including meropenem, amikacin, teicoplanin and fluconazole. Blood culture flagged positive after 24 hours. Its gram stain showed a yeast. Which would be the likely organism?

a. Candida tropicalis
b. Candida albicans
c. Candida parapsilosis
d. Candida krusei
e. Candida dublinensis
Key d
(Iska matlab hai koi aesi yeast thi that was resistant to fluconazole. So remember, Candida krusei is CRUDE and intrinsically resistant to fluconazole!)

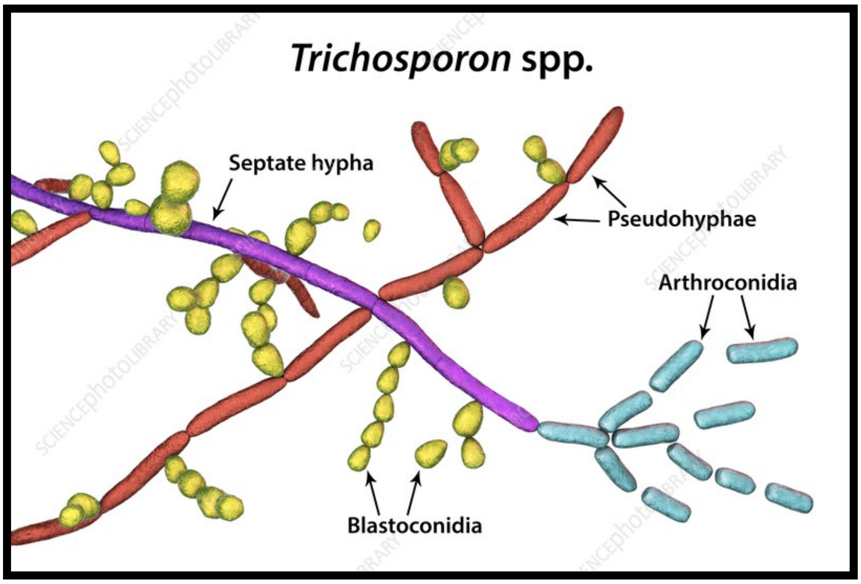
33. A 15 years old boy had history of loose stools, bloating and abdominal pain for few months. Stool examination showed oval cysts about 10-14µm size. What is the ideal treatment for him?

a. Mebendazole
b. Albendazole
c. Pyrantel pamoate
d. Tinidazole
e. Praziquantel
Key d (For Giardia lamblia the treatment is metronidazole/tinidazole…the other dawai listed are for helminths/worms)

34. A wet mount from a skin lesion showed true hyphae, pseudo-hyphae, blastoconidia and arthroconidia. Howeverit was likely a contaminant. The most likely isolate is:

a. Trichophyton rubrum
b. Trichosporon spp
c. Trichophyton sudanense
d. Epidermophyton floccosum
e. Microsporum canis

Key b



35. Some parasites follow the auto-infection route of infection. Which parasite does not have auto-infection in its life-cycle?

a. Cryptosporidium parvum
b. Hymenolepis nana
c. Echinococcus granulosus
d. Strongyloides stercoralis
e. Trichuris trichiura

Key c

Parasites causing autoinfection

- *Hymenolepis nana*
- *Enterobius vermicularis*
- *Taenia solium*
- *Strongyloides stercoralis*
- *Capillaria philippinensis*
- *Cryptosporidium parvum*

Mnemonic:

CHEST

C
H
E
S
T

36. A 15 years old male presented with complaints of off and on fever along with fatigue, weight loss and lymphadenopathy. His blood culture yielded growth of a rapid oxidase positive, gram negative coccocabilli that was urease positive. What would be the treatment of choice?

a. Cotrimoxazole plus gentamicin
b. Ceftriaxone plus azithromycin
c. Metronidazole plus azithromycin
d. Doxycycline plus gentamicin
e. Cotrimoxazole plus doxycycline

Key d **(The organism is Brucella species. Never forget – lamba bukhaar, urease and oxidase positive coccobacilli is Brucella!)**

37. A 27 years old soldier with history of fever for last two weeks presented with severe pain abdomen. X-ray erect abdomen showed gas under the diaphragm. His emergency laparotomy was performed and abdominal collection sent for culture. The isolate responsible for his clinical condition would be:

a. Pseudomonas aeruginosa
b. Escherichia coli
c. Salmonella Typhi
d. Enterococcus faecium
e. Shigella flexneri

Key c **(They're giving a hint keh which organism has caused intestinal perforation – very popular MCQ for Salmonella Typhi)**

38. A 30-year-old woman presented with burning micturition and increased frequency of micturition. Her urine was received for culture that yielded a mucoid lactose-fermenting organism that was sensitive to all tested drugs but resistant to ampicillin. The isolate is most likely:

a. Escherichia coli
b. Klebsiella pneumoniae
c. Enterobacter cloacae
d. Pseudomonas aeruginosa
e. Citrobacter freundii

Key d = KLEBSIELLA CORRECTED

39. An 80-year-old female on a ventilator developed sepsis. Her blood culture yielded NLF colonies, oxidase-negative, resistant to a number of drugs including carbapenems, aminoglycosides, and aztreonam. What would be the likely isolate?

a. Burkholderia cepacia
b. Stenotrophomonas maltophilia
c. Aeromonas hydrophila
d. Acinetobacter baumannii
e. Prevotella spp

Key b

They are basically giving a hint of intrinsic resistance.

Property	Pseudomonas	Burkholderia	Stenotrophomonas
Oxidase	Rapid +ve	Late +ve	Negative
DNAse	-	-	+
Esculin hydrolysis	-	-	+
Colistin	S	IR	S
Carbapenems	S	S	IR

40. A 60-year-old immunocompromised male presented with fever and cough. His sputum sample was received for culture that yielded chalky white colonies on blood agar plate. Gram stain revealed branching GPRs. What treatment will you suggest?

a. Metronidazole
b. Cotrimoxazole
c. Meropenem
d. Linezolid
e. Vancomycin

Key b

REMEMBER: "SNAP"
S N = Sulfa drug for Nocardia
A P = Actinomyces keh liyay Penicillin

41. An 8-year-old boy diagnosed with ALL and admitted to hospital. He was put on immunosuppressive therapy to be prepared for a transplant procedure. A week later, he developed extreme dryness of the mouth and complained of soreness of the buccal mucosa due to oral thrush. Which of the following antibiotics would best remedy his condition?

a. Miconazole
b. Caspofungin
c. Griseofulvin
d. Clotrimazole
e. Nystatin

Key E

42. A lab technician was preparing blood agar media in the lab. He took the agar base suspension and placed it in a device where he heated it at 121°C for 15 minutes. What is the most likely procedure?

a. Boiling
b. Incineration
c. Pasteurization
d. Autoclaving
e. Fumigation
Key d

43. A milk plant owner is concerned about possible infection in his flock. In order to ensure his milk is rendered free of pathogens, he has it heated at 62°C in a device for 30 minutes followed by rapid cooling. What is the most likely process involved?

a. Pasteurization
b. Autoclaving
c. Advanced boiling
d. Tyndallization
e. Coagulation
Key a

44. At the end of a working day in the lab, the night technician collected all the Pasteur pipettes from the discarder and placed them in a device preheated at 180°C for 2 hours. What is the most likely device?

a. Ethylene oxide chamber
b. Plasma chamber
c. Water bath
d. Hot air oven
e. UV chamber
Key d

45. Which of the following is most appropriate for disinfection of Bed-pans?

a. Tincture of iodine
b. Ethanol
c. Hexacholorophene
d. Benz-alkalonium chloride
e. Phenols
Key e

46. A 15 year old girl is brought to the OPD in a drowsy state. According to her mother two days back, she started having complaints of severe headache, fever , photophobia and neck stiffness. Lumbar puncture is performed and CSF culture yields gram negative encapsulated rods that grow on chocolate agar enriched with factors V and X. Regarding this organism which enzyme is most helpful in its pathogenesis?

a. IgA protease
b. Haemagglutinin
c. DNAse
d. Hyaluronidase
e. PV leucocidin
Key a

Growth on chocolate agar enriched with factors V and X: This is a hallmark feature of Haemophilus influenzae type b

47. A pharmaceutical company owner wants to ensure that his commercial batch of IV infusions are rendered free of pathogens. What procedure would you recommend to ensure this?

a. Autoclaving
b. Radiation
c. Ethylene oxide chamber
d. Hot air oven
e. Pasteurization
Key b

(Remember: Agar “filtration” ka option hai then that’s better than radiation!)

48. An Internist at a tertiary care centre is greatly alarmed by the number of infections occurring from similar isolates with similar antibiograms in the ICU patients in the same time period in a month. He decides to sterilize all his respiratory equipment thoroughly to combat the situation. Which of the following methods would you advise to help achieve his goal?

a. Immersion in Glutaraldehyde chamber
b. Passing through Ethylene oxide chamber
c. X-Ray therapy
d. Autoclaving
e. Plasma chamber

Key a

49. Identify the virulence factor of the pathogenic Neisseria species that is responsible for the initial attachment of the organism to host tissues:

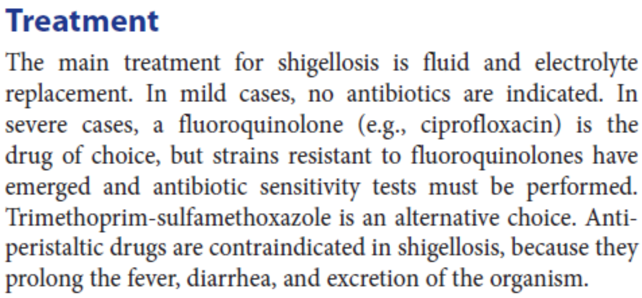
a. Pilli
b. Endotoxin
c. Cell membrane proteins
d. Peptidoglycan
e. Fimbriae

Key a

50. A 5 year old boy presents 3 day history of fever, vomiting and bloody, mucus flecked diarrhea. Bowel frequency is around 10/day and accompanied by abdominal pain. Feces sample was sent for culture and there was growth of non-Lactose fermenting, non-motile, non-H2S producing Gram negative rods on MacConkey agar. Which of the following actions you will recommend for management of this case?

a. Oral or I/V rehydration
b. Early antibiotics to prevent complications
c. Rehydration and ciprofloxacin
d. Passive immunization for siblings
e. Co-administer metronidazole to cover amoebic dysentery

Key c



Treatment

The main treatment for shigellosis is fluid and electrolyte replacement. In mild cases, no antibiotics are indicated. In severe cases, a fluoroquinolone (e.g., ciprofloxacin) is the drug of choice, but strains resistant to fluoroquinolones have emerged and antibiotic sensitivity tests must be performed. Trimethoprim-sulfamethoxazole is an alternative choice. Anti-peristaltic drugs are contraindicated in shigellosis, because they prolong the fever, diarrhea, and excretion of the organism.

51. Which organism is an opportunistic pathogen associated with otitis media and sinusitis in children?

a. Neisseria lactamica
b. Neisseria meningitides
c. Neisseria sicca
d. Moraxella catarrhalis
e. Corynebacterium diptheriae

Key d

52. A Gram-positive bacillus was isolated from a wound specimen and had the following characteristics: double zone of β-hemolysis and lecithinase-positive. What is the most likely identification of the organism?

a. Clostridium perfringenes
b. Clostridium ramosum
c. Clostridium septicum
d. Clostridium tetani
e. Bacillus anthracis

Key a

53. A 16-year-old boy presents with bloody diarrhea. He gives history of having ingested raw milk. The organism's motility can be seen in brucella trypticase soy broth. On which medium should the organism be inoculated?

a. CIN medium
b. MacConkey agar
c. Skirrow medium
d. TCBS medium
e. Sabouraud dextrose agar

Key c (The organism is Campylobacter! – Never forget, if there is mention of raw milk/raw poultry and DYSENTERY look for campylobacter)

54. Regarding Clostridium difficile associated diarrhea, which one of the following statements is correct?

a. Occurs in hospitalized patients
b. Is never community acquired
c. Oral vancomycin is the primary regimen for initial disease
d. Is associated with pseudomembranous colitis in initial disease
e. Is always fatal

Key c

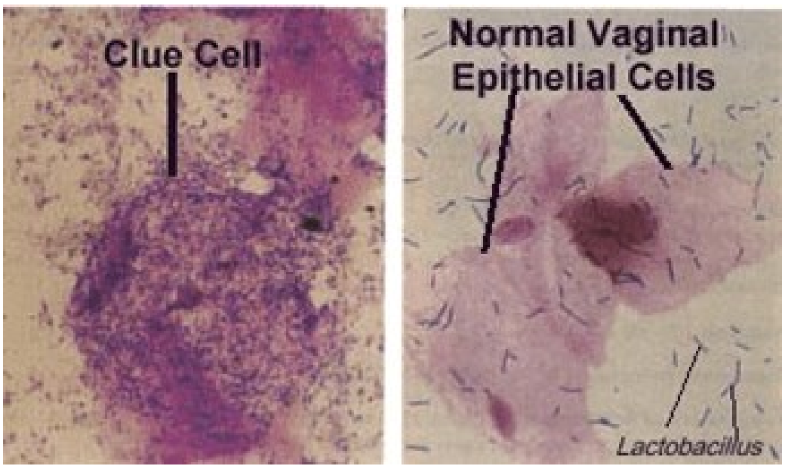
55. A 28-year-old woman presents to her gynecologist with complaints of a malodorous vaginal discharge. Upon examination the physician notes a thin, gray vaginal discharge with no vaginal redness. A whiff test was positive for an amine odor. Which of the following is consistent with this case?

a) Tzank smear
b) Owl-eye cells
c) Clue cell
d) Gram-negative diplococci in PMNs
e) Koilocytic cells

Key c

Clue cells are epithelial cells that are characteristic of bacterial vaginosis. They are vaginal epithelial cells that are coated with Gardnerella vaginalis and other bacteria, which give them a distinctive appearance under a microscope. Clue cells are identified during a wet mount examination, where they appear as vaginal epithelial cells with a fuzzy or "ground-glass" border due to the adherent bacteria.

The presence of clue cells is one of the key diagnostic features of BV, along with a positive whiff test (a fishy odor when a drop of potassium hydroxide is added to a sample of vaginal discharge) and a pH of greater than 4.5 in the vaginal environment.



56. A 25-year-old man complains of a urethral discharge. You perform a Gram stain on a specimen of the dischargeand see neutrophils but no bacteria. Of the organisms listed, the one MOST likely to cause the discharge is:

a) Coxiella burnetii
b) Niesseria gonorrhoeae
c) Chlamydia trachomatis
d) Treponema pallidum
e) Garderenella vaginalis

Key c (In purulent uretheral discharge make two differentials in your mind – either chlamydia or Neisseria gonorrhea. Agar wo kahay pus cell bohat thay aur organism bhi nazar agya, then Neisseria gonorrhea. Agar wo kahay keh pus cells bohat zada thay lekin koi organism hi ni nazar aya, then Chlamydia trachomatis)

57. Which of the following is commonly used in the laboratory setting to provide a good quality of protection against transmission of the human immunodeficiency virus (HIV)?

a) Ethyle alcohol
b) House hold bleach
c) Pyodine
d) Germicidal soap
e) Hot air

KEY b

58. The soil is the natural habitat for certain microorganisms of medical importance. Which one of the following is least likely to reside there?

(A) Clostridium tetani
(B) Mycobacterium avium-intracellulare
(C) Bacillus anthracis
(D) Chlamydia trachomatis

Key d

59. Most common clinical syndrome associated with Mycoplasma pneumoniae

A. Hemolytic anemia
B. Lobar pneumonia
C. Tracheobronchitis
D. Bullous Myringitis
E. Pericarditis

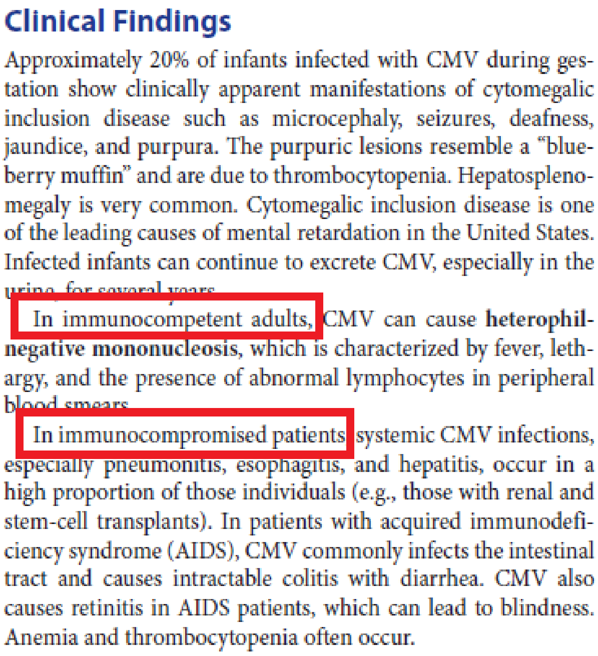
Key: c

Mycoplasma pneumoniae **is a common cause of atypical pneumonia (DIFFUSE INTERSTITIAL not lobar) While it can cause a variety of clinical manifestations, tracheobronchitis (inflammation of the trachea and bronchi) is the most frequent presentation, especially in younger patients. Other manifestations such as hemolytic anemia and bullous myringitis may occur but are less common.**

60. Cytomegalovirus (CMV) is isolated from the urine sample of a 20 year old, previously healthy, immunocompetent girl. Which one of the following manifestations of CMV disease is most commonly seen in immunocompetent adults?

a) Vesicular skin rash
b) Mononucleosis syndrome
c) Viral pneumonia
d) Hepatitis
e) Retinitis

Key b



Clinical Findings

Approximately 20% of infants infected with CMV during gestation show clinically apparent manifestations of cytomegalic inclusion disease such as microcephaly, seizures, deafness, jaundice, and purpura. The purpuric lesions resemble a "blueberry muffin" and are due to thrombocytopenia. Hepatosplenomegaly is very common. Cytomegalic inclusion disease is one of the leading causes of mental retardation in the United States. Infected infants can continue to excrete CMV, especially in the urine, for several years.

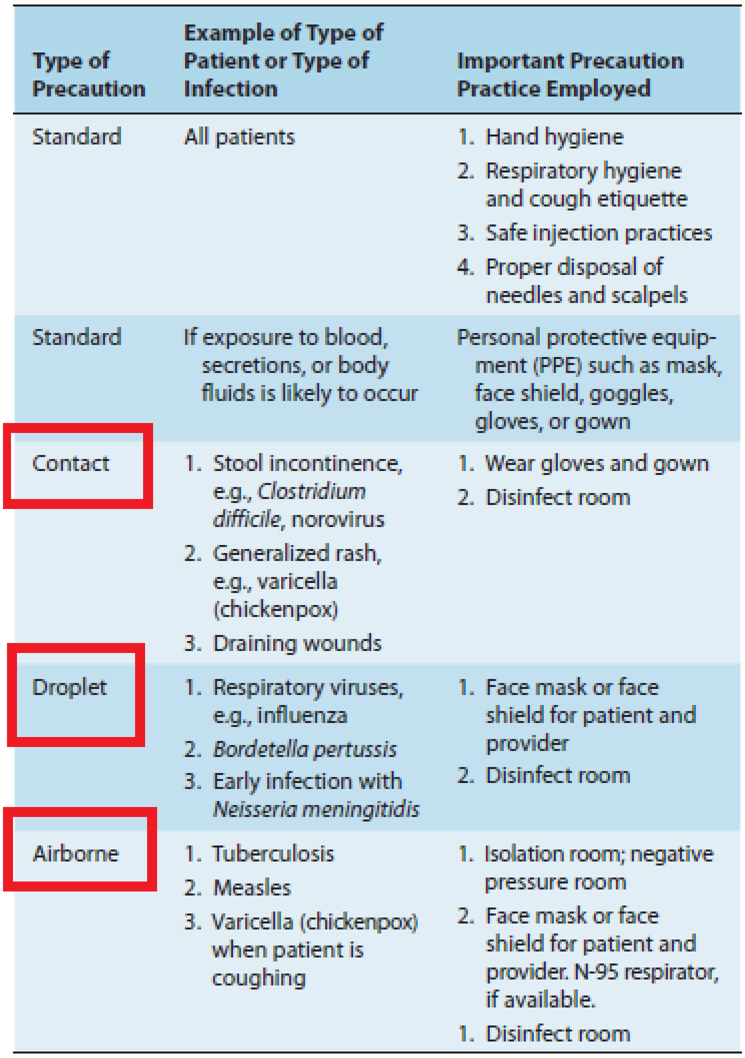
In immunocompetent adults, CMV can cause **heterophil-negative mononucleosis**, which is characterized by fever, lethargy, and the presence of abnormal lymphocytes in peripheral blood smears.

In immunocompromised patients systemic CMV infections, especially pneumonitis, esophagitis, and hepatitis, occur in a high proportion of those individuals (e.g., those with renal and stem-cell transplants). In patients with acquired immunodeficiency syndrome (AIDS), CMV commonly infects the intestinal tract and causes intractable colitis with diarrhea. CMV also causes retinitis in AIDS patients, which can lead to blindness. Anemia and thrombocytopenia often occur.

61. A 70 year old male was admitted with sudden onset of fever, sore throat, shortness of breath, dry cough and generalized muscle aches and pains. On examination the patient is pale, tachycardic and tachypneic. His conjunctivae are congested and rales and wheezes are heard over both lung fields. A chest radiograph shows diffuse bilateral infiltrates. Provisional diagnosis of Influenza was made. Which of the following is mode of spread for this virus?

a) Aerosol + Contact
b) Contact
c) Droplet
d) Feco-oral Common vehicle

Key a
CORRECTED = DROPLET = C (REFERENCE LEVINSON)



Type of Precaution	Example of Type of Patient or Type of Infection	Important Precaution Practice Employed
Standard	All patients	1. Hand hygiene 2. Respiratory hygiene and cough etiquette 3. Safe injection practices 4. Proper disposal of needles and scalpels
Standard	If exposure to blood, secretions, or body fluids is likely to occur	Personal protective equipment (PPE) such as mask, face shield, goggles, gloves, or gown
Contact	1. Stool incontinence, e.g., *Clostridium difficile*, norovirus 2. Generalized rash, e.g., varicella (chickenpox) 3. Draining wounds	1. Wear gloves and gown 2. Disinfect room
Droplet	1. Respiratory viruses, e.g., influenza 2. *Bordetella pertussis* 3. Early infection with *Neisseria meningitidis*	1. Face mask or face shield for patient and provider 2. Disinfect room
Airborne	1. Tuberculosis 2. Measles 3. Varicella (chickenpox) when patient is coughing	1. Isolation room; negative pressure room 2. Face mask or face shield for patient and provider. N-95 respirator, if available. 1. Disinfect room

62. **A female 43 years old, doctor by profession, presents to a hospital reception with history of fever for the last 2 days. There is no isolation ward available. On enquiry, she also informs the doctor that she was in West Africa about 18 days back working with an international charity organization. Considering the Ebola outbreak in West Africa, what should be an appropriate action by the doctor?**

a) Return the patient as no isolation ward available
b) Shift the patient to side room with separate bathroom
c) Examine and treat the patient as in a routine
d) No special precautions needed
e) Antivirals to cover possible exposure to Ebola virus

Key b

Ebola virus can be transmitted through bodily fluids such as urine, vomit, diarrhea, sweat, and blood. A separate bathroom ensures that the patient's bodily fluids do not come into contact with shared or communal facilities, reducing the risk of spreading the virus.

63. CDC recommends that instruments exposed to prions must be

a) Autoclaved at 134 °C for 1 hour followed by immersion in 1 N NaOH
b) Dry heat at 180 °C for 2 hours
c) Immersion in 10 % Bleach followed by autoclave at 121 °C for 1 hour
d) Immersion first in Tween 80/I hour followed by Cetylpyridinium chloride
e) Sterilization with ozone for 2 hours

Key a

64. A 5 year old boy presents with 5 day h/o vomiting and fever up to 39 oC, followed 2-3 days later by abdominal pain and non-bloody diarrhea. His fever and symptoms further worsened needing hospitalization and I/V antimicrobials. His blood counts, LFTs and RFTs were with in normal limits. Culture of feces lead to growth of motile, non-lactose fermenting Gram negative rods. TSI slants showed red slants with black butt. What is the most likely etiological agent?

a) Salmonella paratyphi 'C'
b) Enterohemorrhagic Escherichia coli
c) Non Typhoidal Salmonella Species
d) Campylobacter jejuni
e) Shigella spp

Key c

Poor quality MCQ – BUT REMEMBER - Given the acute gastroenteritis symptoms, the normal laboratory findings, and the lack of signs suggestive of enteric fever (like prolonged fever, systemic involvement, or hepatosplenomegaly), Non-Typhoidal Salmonella is a more likely cause.

65. Which of the following is a category B select agent

a) Bacillus anthracis
b) Small pox virus
c) Fransicella tularensis
d) Coxiella burnetii
e) Marburg virus

Key d (Bacillus anthracis, Smallpox virus, Francisella tularensis, and Marburg virus are all classified as Category A select agents, which have a higher potential for widespread harm and are considered high-priority biological threats.)

66. A Pakistani family has just returned from Canada and their 11 year old daughter developed fever, abdominal cramps and diarrhea which was initially watery and became bloody after 2 days. They consumed burgers on their way to airport. Examining doctor suspects infection with a shiga toxin producing organism. Which one of the following options you will choose?

a) Stool culture on Sorbitol McConkey agar and I/V fluids for volume expansion
b) I/V fluids + Shiga toxin in stool and culture for EHEC
c) Toxin detection in stool and I/V saline for volume expansion
d) Toxin detection in stool and I/V Antibiotics
e) Stool culture + Toxin detection + Antibiotics

Key b

- The symptoms described, such as fever, abdominal cramps, diarrhea that turned bloody, and a history of consuming burgers, suggest an infection with a Shiga toxin-producing organism, specifically Enterohemorrhagic Escherichia coli (EHEC).
- The best course of action would be to:
    a. Administer IV fluids for hydration and volume expansion
    b. Test for Shiga toxin in the stool
    c. Perform a stool culture to confirm the presence of EHEC
- Antibiotics are not recommended for EHEC infections, as they can increase the risk of developing hemolytic-uremic syndrome (HUS), a potentially life-threatening complication.

67. The most important cause of blood stream infections in febrile neutropenic patients are

a) Candida species
b) Gram positive bacilli
c) Gram negative bacilli
d) Gram variable coccobacilli
e) CMV

Key c (CONTROVERSIAL BUT DISCUSSED WITH SENIORS. CHOOSE C > A)

68. Stool sample for isolation of Vibrio cholera should be transported in

a) Buffered glycerol saline
b) Alkaline peptone water
c) Selenite F broth
d) Tetrathionate broth
e) Thioglycolate broth

Key b

69. A 54 year old male with chronic leukemia presents with a rapidly advancing infection of the nasal sinuses. Biopsy and stain of the specimen with calcouflor white showed fragments of non-septate, broad hyphae. The MOST likely organisms is:

a) Candida dublinensis
b) Agent of Mucormycosis
c) Aspergillus tereus
d) Coccidioides imitis
e) Cryptococcus neoformans

Key b

70. The risk of transmission of HIV by needle stick injury from HIV positive patient is around:

a) 30 %
b) 3 %
c) 0.3%
d) 70 %
e) 90 %

Key c

The transmission risks are approximately:

- **HBV: 30%**
- **HCV: 3%**
- **HIV: 0.3%**

VERY IMPORTANT

71. A 67-year old male brought to ED for the abrupt onset of shaking chills, high grade fever and pain on the right side of his chest that began the prior evening. X-ray chest reveals consolidation in right upper lung. With the help of sputum examination in lab, identification of Streptococcus pneumoniae as a causative agent was made. Which of the following options is most appropriate for Identification of this organism?

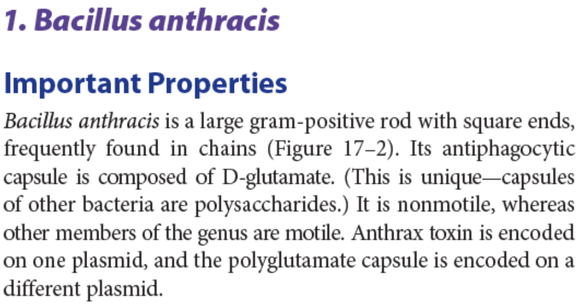
a) Diplococci + α-hemolysis + bile insolubility + optochin sensitive
b) Diplococci + β-hemolysis + bile solubility + optochin sensitive
c) Cocci in chains + α-hemolysis + Inulin fermentation + optochin sensitive
d) Diplococci + β-hemolysis + bile insolubility + optochin sensitive
e) Diplococci + α-hemolysis + bile solubility + optochin sensitive

Key e

72. Which bacterial capsule is made up of amino acids?

a) Bacillus anthracis
b) Streptococcus pneumococcus
c) Haemophilus influenza
d) Neisseria meningitidid
e) Cryptococcus neoformans

Key a



1. *Bacillus anthracis*

Important Properties

Bacillus anthracis is a large gram-positive rod with square ends, frequently found in chains (Figure 17–2). Its antiphagocytic capsule is composed of D-glutamate. (This is unique—capsules of other bacteria are polysaccharides.) It is nonmotile, whereas other members of the genus are motile. Anthrax toxin is encoded on one plasmid, and the polyglutamate capsule is encoded on a different plasmid.

73. A female medical practitioner, who works in Out Patient Department and deals with a variety of patient from community, visits you for advice. She is pregnant and is in first trimester of pregnancy. About two weeks back,another lady health worker in their OPD had confirmed infection with Rubella virus. Following a mild nonspecific illness, she is worried about acquiring an infection which may harm the fetus. Which of the following should be your advice?

a) Monthly ultrasonography
b) Rubella IgG testing
c) Terminate pregnancy
d) Rubella IgM testing
e) I/VImmunoglobulins to protect the fetus

Key d

74. Clostridium difficile associated diarrhea

a) Occurs In all hospitalized patients
b) Occurs only in those colonized by toxigenic C. difficile strains
c) Is treated by broad spectrum cephalosporins
d) Is improved by giving Proton pump inhibitors
e) Is never community acquired

Key b

75. Which of the transport mechanisms functions without requirement for energy

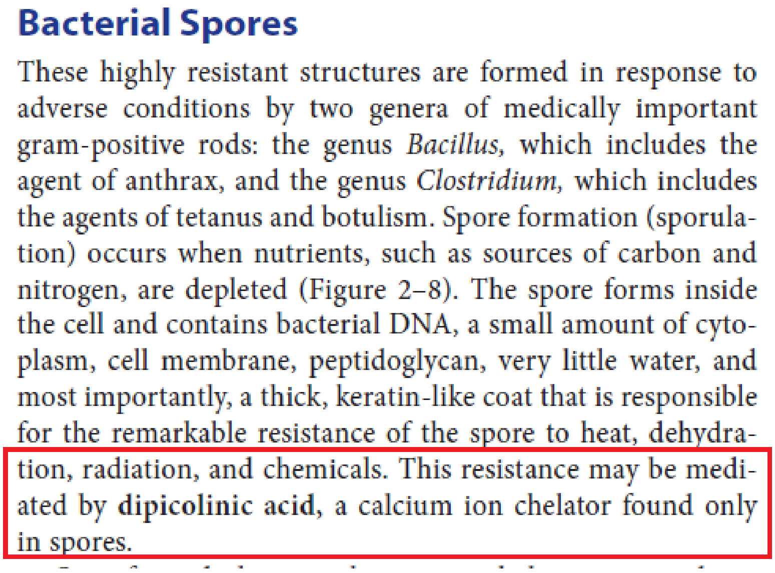
a) Diffusion
b) Symport
c) Uniport
d) Binding protein dependant
e) Efflux pump

Key a

76. Heat resistance of bacterial spores of Bacillus anthracis is due in part to their dehydrated state and in part to presence of large amount of

a) Diaminopimelic acid
b) D-Glutamic acid
c) Calcium dipicolate
d) Lipid A
e) Peptidoglycan

Key c (don't confuse with option B. glutamic acid tou capsule tha bacillus anthracis ka!)



Bacterial Spores

These highly resistant structures are formed in response to adverse conditions by two genera of medically important gram-positive rods: the genus *Bacillus,* which includes the agent of anthrax, and the genus *Clostridium,* which includes the agents of tetanus and botulism. Spore formation (sporulation) occurs when nutrients, such as sources of carbon and nitrogen, are depleted (Figure 2–8). The spore forms inside the cell and contains bacterial DNA, a small amount of cytoplasm, cell membrane, peptidoglycan, very little water, and most importantly, a thick, keratin-like coat that is responsible for the remarkable resistance of the spore to heat, dehydration, radiation, and chemicals. This resistance may be mediated by **dipicolinic acid,** a calcium ion chelator found only in spores.

77. A 58 year old lady with diabetes mellitus, have moderate dysuria. Urine culture yielded growth of Candida albicans after overnight incubation. Candida albicans is usually a relatively harmless commensal parasite. Which of the following has minimal contribution to the ability of the organism to cause infection?

a) Decreased immune defenses
b) Increased mannan-binding to fibronectin and collagen
c) Production of mycotoxins by yeast cells in tissue
d) Increased use of antibiotics
e) Production of proteinase by the organism in tissue

Key c

Production of mycotoxins by yeast cells in tissue is NOT a significant virulence factor of Candida albicans. While some Candida species produce mycotoxins, Candida albicans does not. Mycotoxins are typically associated with fungal species such as Aspergillus, and are not a major contributor to the pathogenicity of Candida spp.

78. Which of the following specimens should not be refrigerated?

a. Urine
b. Sputum
c. Throat swab
d. CSF

KEY: d

79. A 62 years male who is on steroids, presents with respiratory problems. Examination of a sputum specimen reveals yeast cells. A latex agglutination test for antigen is also positive, as is an India ink test for capsules. Which organism is MOST likely?

a) Candida albicans
b) Coccidioides immitis
c) Cryptococcus neoformans
d) Aspergillus flavus
e) Blastomyces dermatitidis

Key c

80. A 14 year old boy, a farmer's son was bitten by his pet dog. The boy's father shot the dog in shear anger. The boy's wound was treated by local practitioner with antisepsis and wound was closed with sutures. About 24 hours later, cellulitis developed and he was taken to hospital where suture were removed and tissue sent for culture. Which of the following set of organisms are expected to be found on culture?

a) Staphylococcus aureus and S. epidermidis
b) Rabies virus and multiple spp of aerobic/ anaerobic bacteria
c) Anaerobic clostridial species and atypical Mycobacteria
d) Anaerobes, streptococcus spp and Pasteurella multocida
e) Pasteurella multocida, anaerobes and Nocardia spp

Key d

81. A patient with active pulmonary T.B admitted in hospital. What type of isolation precautions would you recommend for this patient:

a) Contact precautions
b) Droplet precautions
c) Air borne precautions
d) Transmission based precautions
e) Universal Precautions

Key c (Remember "TMV" for airborne infections = TB, measles and varicella)

82. A young male presents with 2-3 Cm lesion just below left angle of jaws. He complains that although he has mild pain/discomfort but pus discharge is worrying him. On enquiry he informs that he is a boxer and was severely beaten by an opponent a week or so back and sustained facial injuries. Anaerobic culture of pus yielded growth of Gram positive branching rods. What is the likely causative agent?

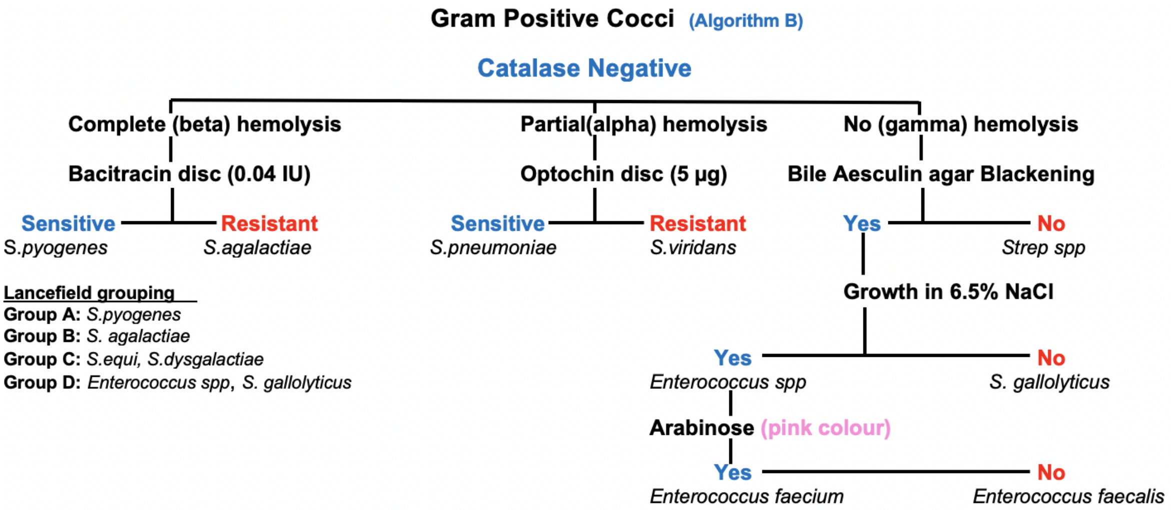
a) Psedoalleshcaria boydii
b) Nocardia asteroids
c) Actinomyces spp
d) Mycobacterium scrufulacium
e) Actinomedura medurii

Key c (Boxer ka mukka pernay ki history with yellow sulfur granules and gram positive anaerobic condition main ugnay wali rods then pakka Actinomyces!)

83. An 80 year old female is suffering from UTI (Urinary Tract Infection). Her urine sample was sent to the lab routine examination as well as culture and sensitivity. On routine examination (Urine R/E) there were 20 – 25 WBCs. Culture revealed non-hemolytic pin point colonies on Blood agar. Gram stain revealed Gram positive cocci. Lancefield grouping identified them as Group D streptococci. What is the next best step in identification of species.

a) Perform oxidase test
b) Inoculate enterococcus set
c) Inoculate on CLED agar
d) Perform PYR test
e) Perform reverse CAMP test

Key b


Gram Positive Cocci (Algorithm B)
Catalase Negative
Complete (beta) hemolysis
Bacitracin disc (0.04 IU)
Sensitive
S.pyogenes
Resistant
S.agalactiae
Partial(alpha) hemolysis
Optochin disc (5 µg)
Sensitive
S.pneumoniae
Resistant
S.viridans
No (gamma) hemolysis
Bile Aesculin agar Blackening
Yes
No
Strep spp
Growth in 6.5% NaCl
Yes
Enterococcus spp
No
S. gallolyticus
Arabinose (pink colour)
Yes
Enterococcus faecium
No
Enterococcus faecalis
Lancefield grouping
Group A: S.pyogenes
Group B: S. agalactiae
Group C: S.equi, S.dysgalactiae
Group D: Enterococcus spp, S. gallolyticus

84. Fifteen year old, malnourished boy who lives in a slum have recurrent episodes of diarrhea for a period of more than a year. Examination of stools revealed fat-malabsorption. Direct microscopy on freshly passed stool clinched the diagnosis. Which one of the following agent is responsible?

a) Balantidum Coli
b) Entamoeba histolytica
c) Ankylostoma duodenale
d) Giardia lamblia
e) Isospora belli

Key d (Hint: Fat malabsorption/steatorrhea wali hint per Giardia ko zaroor differential bana len! “Direct microscopy of freshly passed stool” ka matlab hai trophozites bhaagtay phirtay fresh stool main nazar agaye maza agya)

85. A 5 year old boy was brought to hospital with 2 days history of fever and sore throat. He did not have runny nose, conjunctivitis or cough. There is redness of tonsillar area, palate and pharynx. Anterior cervical lymph nodes at the angle of mandible were enlarged and tender. A throat swab was obtained and sent for culture which, after overnight incubation revealed small beta hemolytic colonies. The isolate was sensitive to bacitracin. Which of the following action will you recommend?

a) Test for penicillinase production prior to starting penicillin
b) Early steroids to prevent long term sequalae
c) Isolate the patient to prevent spread of infection to others
d) Add clindamycin for treatment of toxic shock caused by this organism
e) Close contacts should be screened for the organism

Key d **(The isolate is pyogenes. Usmay kabi penicillin ki resistance nai dekhi gayi so no use of testing penicillin. However toxic shock syndrome is a deadly complication so it's necessary to add clindamycin so that it can stop toxin production ASAP. Clindamycin is a protein synthesis inhibitor acting on 50S!)**

86. Which of the following micro-organism does not grow on MacConkey agar?

a) Streptococcus agalactia
b) Streptococcus bovis
c) Enterococcus feacium
d) Streptococcus pyogenes
e) Listeria monocytogenes

Key d

87. Which of the following definitions best defines synergism?

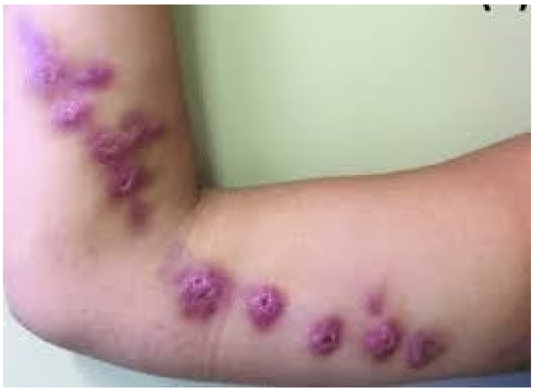
a) Activity of the drug combination is equal to the sum of the individual agents
b) The test organism is resistant to both drugs in the combination
c) Activity of the drug combination is greater than sum of the individual agents
d) The test organism is susceptible to both drugs in the combination
e) Activity of the drug combination is less than the sum of the individual agents

Key c (Matlab 2 + 2 = 6)

88. A young woman pricked her finger while pruning roses and subsequently develops a localized pustule progressing to an ulcerative lesion. Several nodules develop along the local lymphatic drainage of the site of injury. Which of the following is responsible for the lesions?

a) Candida glaberata
b) Chemical poison (insecticides sprayed on the plant)
c) Cryptococcus neoformans
d) Sporothrix schenkii
e) Blastomyces dermatitidis

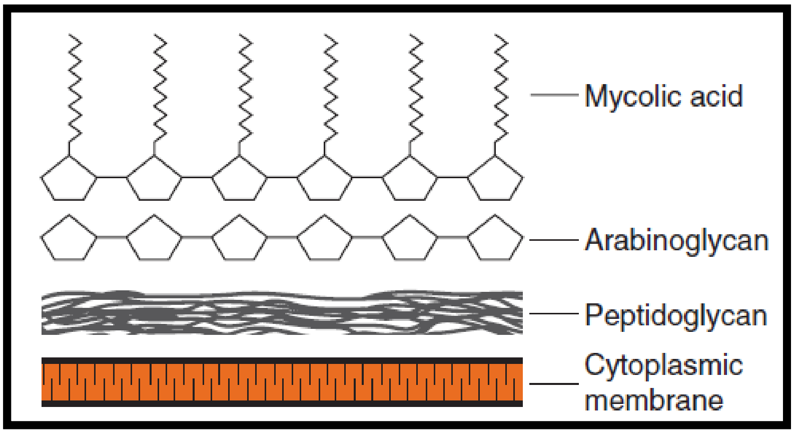
Key d **(Rose pruning walay gardner main sporotrichosis zaroor sochen!)**



89. A 15 year old boy comes to the OPD with complaints of night sweats, evening pyrexia, dry cough, and drastic weight loss over the past several weeks. O/E he is found to have enlarged cervical lymph nodes. He also complains of expectorating very small amount of whitish sputum early in the morning after waking up. The sputum is sent for investigation. Gram stain does not reveal anything wheras Ziehl-nelson stain reveals pink rods on a blue background . What is the component of cell wall that contributes to the acid fastness of mycobacteria??

a) teichoic acid
b) lipo polysaccharide
c) mycolic acid
d) peptidoglycan
e) muramic acid

Key c



90. Laboratory diagnosis of tuberculosis by culture takes a long time (several weeks). Skin test can be performed easily by any hospital laboratory. Which of the following is correct regarding skin test for tuberculosis (Montoux test):

a) Detects antibodies to mycobacterial antigens
b) Detects cell-mediated immune response to mycobacterial antigens
c) Uses the bacillus of Calmette-Guerin strain as the antigen source.
d) Negative result rules out infection with Mycobacterium tuberculosis.
e) Positive result confirms infection with Mycobacterium tuberculosis

Key b

91. A non-pigmented mycobacterium is isolated that reduces nitrate to nitrite and is niacin-positive. You should suspect:

a) M. kansasii
b) M. laprae
c) M. tuberculosis
d) M. avium complex
e) M. bovis

Key c (FOR MICRO)

92. A 4-year-old girl brought to the OPD by her mother with complaints of dry cough, night sweats, evening pyrexia and weight loss over the past month. Mantoux test was performed which showed 10 mm induration. The mother confirmed that the child's immunization had been completed successfully. Based on the result what should be the next step taken by the physician?

a) Do nothing as the result is normal
b) Repeat the mantoux test
c) Put the girl on ATT immediately
d) Suspect tuberculosis & investigate further
e) Give a booster dose of BCG alongwith starting ATT

KEY d

93. An 11 year old boy suffering from hereditary spherocytosis was scheduled to undergo Total splenectomy. His physician was concerned for him being susceptible to infections by certain pathogenic bacteria. As a microbiologist which vaccines would you advise for the boy to get administered before the surgery?

a) BCG, TT, MMR
b) OPV, Hep B, Hib
c) DPT, menomune, OPV
d) Menactra, Hib, TT
e) Quadrivalent Meningococcal, Pneumovax, Hib

KEY: e (Remember mnemonic "PIN" i.e. Pneumococcus, Hemophilus Influenzae, Neisseria meningiditis – Yay teeno capsulated hain, teeno ki vaccine splenectomy walay ko deni hai, teeno ki vaccine main capsular polysaccharide hai, teeno IgA protease produce kertay hain)

94. The doubling time of mycobacterium tuberculosis is

a) 8 mins
b) 18 mins
c) 8 hrs
d) 18 hrs

Key D CORRECTED

95. A 18 yr old girl comes into a clinic with pain in right ear. She is on her school swim team and spends about 2hrs/day in the pool. Alongwith pain in her ear, she has watery drainage from the ear canal slightly green in colour. The organism most likely causing this:

a) Staphylococcus aureus
b) Streptococcus pneumoniae
c) Moraxella catarrhalis
d) Pseudomonas aeruginosa
e) Streptococcus pyogenes

Key d

96. Which of following agent is not associated with diarrhea?

a) Clostridium perfringenes
b) Enterococcus faecalis
c) Escherichia coli
d) Vibrio cholera
e) Campylobacter jejuni

Key b

97. A 37 years old manual laborer developed malaise, headache, fever and chills. His condition deteriorated further which lead to hospitalized and he was placed on ventilator. CXR showed multilobar infiltrates. Gram staining of broncho-alveolar lavage (BAL) fluid revealed many white cells but no organism. Tests for fungi and Pneumocystis were also negative. Culture of fluid on Buffered Charcol-Yeast Extract (BCYE) agar yielded growth of thin, long Gram Negative Rods whereas there was no growth on sheep Blood Agar. Which of the following management options will you choose?

a) Glycopeptides and oxygen
b) Glycopeptides and Immunoglobulins
c) Carbapenems and Isolation
d) Isolate patient + Azithromycin / fluoroquinolones
e) Azithromycin / fluoroquinolones

Key e (The organism is Legionella pneumophila – usmay person to person transmission negligible hai. Tou siraf dawai den isolate na keren)

98. A 30 year old I/V drug user who was an asymptomatic HBV carrier is hospitalized with severe hepatitis following infection with delta agent. The delta agent was able to cause hepatitis with direct HBV assistance due to which one of the following options?

a) Intracellular survival
b) Cytoplasmic penetration
c) Replication of viral RNA
d) Translation of viral transcripts
e) Coating of viral particles

Key E (CORRECTED) The delta agent (also known as Hepatitis D Virus, or HDV) is a defective virus that cannot replicate or cause disease on its own. It requires Hepatitis B Virus (HBV) for helper functions, particularly for the coating of its viral particles.

99. Several pathogens are transmitted either during gestation or at birth. Which one of the following is LEAST likely to be transmitted at these times?

(A) Haemophilus influenzae
(B) Treponema pallidum
(C) Neisseria gonorrhoeae
(D) Chlamydia trachomatis

Key a

100. A 55-year old man had dental implant surgery performed. A week later he presented to the emergency with complaints of high grade fever, palpitations, tachycardia and shortness of breath. Murmurs were heard on chest auscultation. He was diagnosed with infective endocarditis. The physician suspected infection with Streptococcus viridians. Which next step would help the microbiologist confirm the diagnosis?

a) Resistance on optochin drug disc
b) positive CAMP test
c) Hippurate hydrolysis
d) Bile esculin hydrolysis
e) Sensitivity on bacitracin drug disc

KEY: a

101. A 35 years old male presented with history of few well demarcated skin lesions with central hypopigmentation and hypoesthesia on his trunk and extremities. Skin biopsy of lesion revealed granulomatous inflammation. ZN stain show acid fast bacilli, but the organism did not grow on LJ media. The lesions are caused by

a) Mycobacterium Asiaticum
b) Mycobacterium ulcerans
c) Mycobacterium leprae
d) Mycobacterium marinum
e) Mycobacterium fortuitum

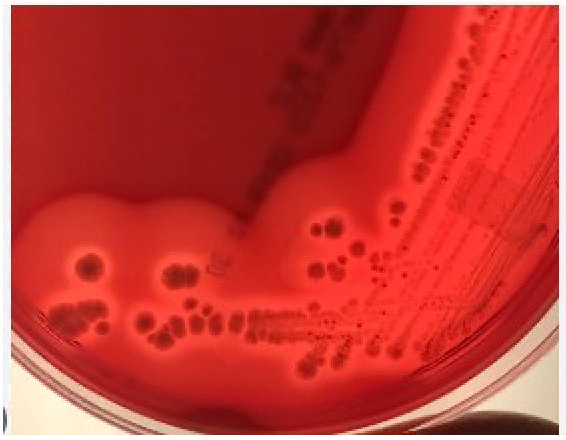
Key c

M. leprae is a very slow-growing organism that cannot be cultured on standard media like Lowenstein-Jensen (LJ) media. This is a key feature distinguishing M. leprae from other mycobacterial species, which can typically be cultured in a laboratory setting. Yay bas footpad of armadillo main culture kia jasakta.

102. A 15 year old boy sustained deep traumatic injury on his left lower leg after road traffic accident. After two days he developed pain swelling and foul smelling discharge from wound. Pus culture revealed growth on **Wilkins-Chalgren** Anaerobe Agar anaerobically with double zone of hemolysis. Gram stain revealed Gram positive rods with subterminal spores. Isolate is nonmotile. The most probable isolate identification is

a) Clostridium novyi
b) Clostridium perfringens
c) Clostridium sporogens
d) Clostridium tetani
e) Clostridium septicum

Key b



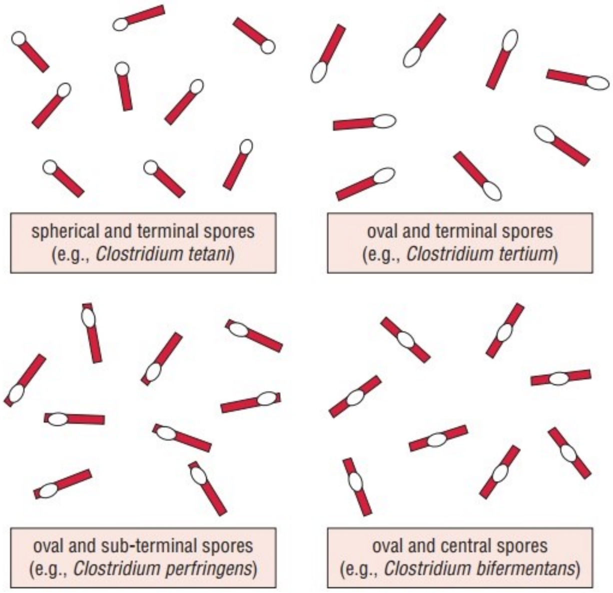
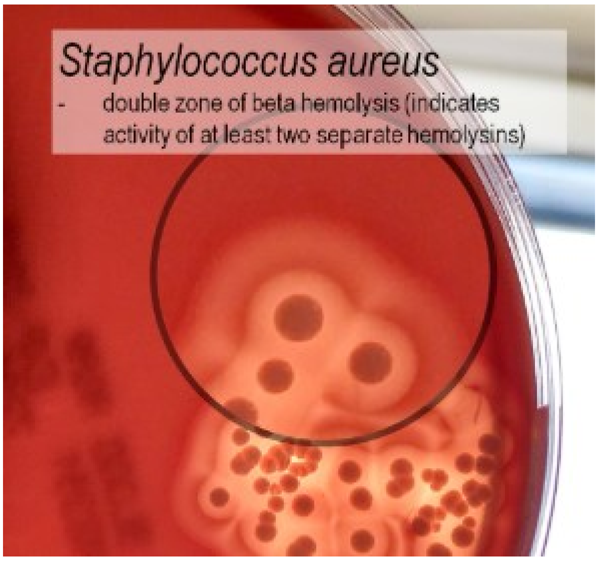

spherical and terminal spores
(e.g., *Clostridium tetani*)
oval and terminal spores
(e.g., *Clostridium tertium*)
oval and sub-terminal spores
(e.g., *Clostridium perfringens*)
oval and central spores
(e.g., *Clostridium bifermentans*)

FIG. 29-1. Schematic diagram showing different types and arrangement of spores.



Staphylococcus aureus

- double zone of beta hemolysis (indicates activity of at least two separate hemolysins)

103. A middle aged man has had persistent bloody diarrhea, abdominal cramps, and low grade fever for one week. Stool sample was positive for occult blood. Colonoscopy shows marked mucosal erythematic with focal ulceration from the rectum to the ascending colon. The ulcers do not penetrate the muscularis propria. Which of the following infectious organisms is most likely to produce these findings?

a) Bacillus cereus
b) Entamoeba histolytica
c) Giardia lamblia
d) Salmonella enterica
e) Shigella flexneri
Key b

Key points supporting Entamoeba histolytica:

Persistent bloody diarrhea: A hallmark of invasive infections by *Entamoeba histolytica*.
Colonic involvement: The parasite often affects the cecum, ascending colon, and rectum, leading to ulceration and inflammation.
Focal ulceration: Flask-shaped ulcers are characteristic, though not always observed on colonoscopy. They usually do not penetrate beyond the muscularis propria.

104. A 40 Year male with atrophic gastritis belongs to Karachi develops sudden, severe, profuse watery diarrhea and become severely dehydrated within next 48 hours. On physical examination, he is afebrile and has poor skin turgor. Laboratory studies of the diarrheal fluid show microscopic flecks of mucus, but no blood and few WBCs. A blood culture is negative. The most likely causative organism is?

a) Bacillus cereus
b) Entamoeba histolytica
c) Salmonella enterica
d) Shigella flexneri
e) Vibrio cholera
Key e

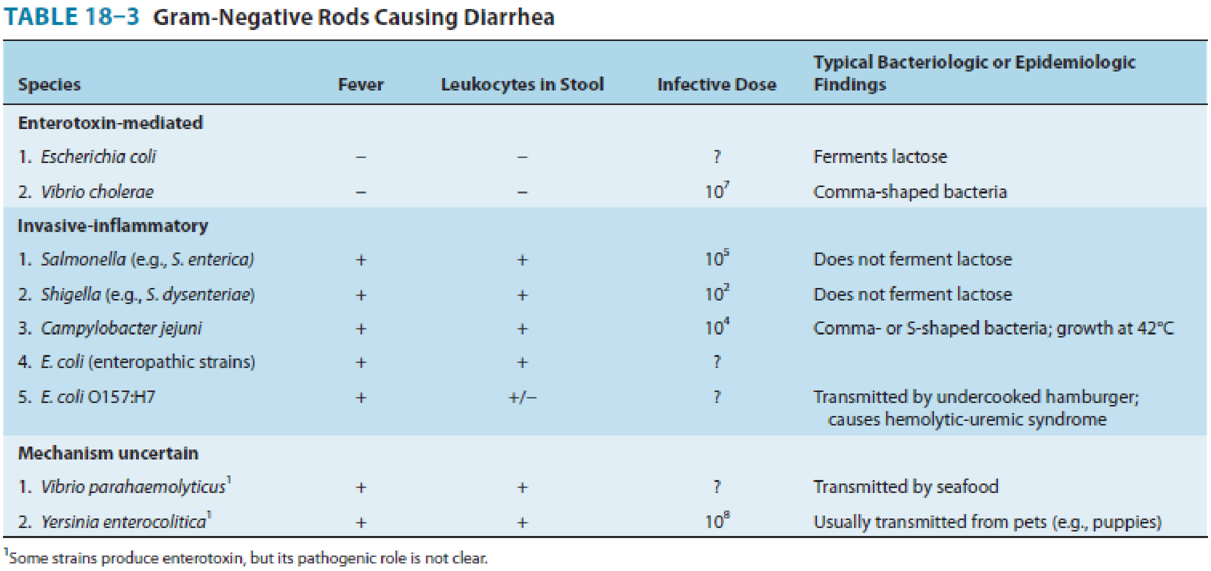


TABLE 18–3 Gram-Negative Rods Causing Diarrhea

Species	Fever	Leukocytes in Stool	Infective Dose	Typical Bacteriologic or Epidemiologic Findings
Enterotoxin-mediated				
1. *Escherichia coli*	–	–	?	Ferments lactose
2. *Vibrio cholerae*	–	–	10^7	Comma-shaped bacteria
Invasive-inflammatory				
1. *Salmonella* (e.g., *S. enterica*)	+	+	10^5	Does not ferment lactose
2. *Shigella* (e.g., *S. dysenteriae*)	+	+	10^2	Does not ferment lactose
3. *Campylobacter jejuni*	+	+	10^4	Comma- or S-shaped bacteria; growth at 42°C
4. *E. coli* (enteropathic strains)	+	+	?	
5. *E. coli* O157:H7	+	+/–	?	Transmitted by undercooked hamburger; causes hemolytic-uremic syndrome
Mechanism uncertain				
1. *Vibrio parahaemolyticus*[1]	+	+	?	Transmitted by seafood
2. *Yersinia enterocolitica*[1]	+	+	10^8	Usually transmitted from pets (e.g., puppies)

[1] Some strains produce enterotoxin, but its pathogenic role is not clear.

105. A 28 year old primigravida at 18 weeks gestation develops nausea with vomiting for 3 days followed by severe headache and neck stiffness. On physical examination, she was febrile and has no papilledema. Gram stain of the CSF obtained by lumbar puncture shows many short, gram positive rods, and with a wet mount, the organisms demonstrate tumbling motility. In culture, this organism grows at 25°C. She most likely acquired this illness through which of the following mechanisms?

a) Ingestion of contaminated food
b) Inhalation of droplet nuclei
c) Inoculation through a cut on the skin
d) Sharing infected needles
e) Using a friends tooth brush
Key a (The organism is Listeria monocytogenes!)

106. A 45 year old asymptomatic male with positive RPR (titre 1:16) and TPPA test was diagnosed to have late latent syphilis. He was treated and gradual decline in RPR titre was monitored for treatment response. His RPR remained positive at low titres (1:4) even after two years. This persistent sero-positivity signifies

A: Co-infection with non venereal treponemas
B: Further course of treatment with higher doses
C: Re-infection
D: Serofast state
E: Treatment failure
Key d

This refers to a situation where RPR remains positive at low titres after treatment for syphilis, without active disease. It typically occurs in latent syphilis cases and does not indicate treatment failure or re-infection.

107. A 22 year old woman has had pelvic pain, fever and vaginal discharge for 3 weeks. On physical examination, she has lower abdominal adnexal tenderness and a painful, swollen left knee. Laboratory studies show WBC count of 11.8x103/µl with 76% neutrophils, 18% lymphocytes, and 6% monocytes. She receives Ceftriaxone therapy, but is not adherent with this therapy. She undergoes a work up for infertility 5 years later. Which of the following infectious agents is most likely to produce these findings?

a) Gardnerella vaginalis
b) Herpes simplex virus 2
c) Neisseria gonorrhoeae
d) Treponema pallidum
e) Trichomonas vaginalis
Key c

Explanation:

- This patient presents with pelvic pain, fever, vaginal discharge, adnexal tenderness, and a swollen, painful knee, which are suggestive of **pelvic inflammatory disease (PID)**, likely caused by **Neisseria gonorrhoeae**.
- **Neisseria gonorrhoeae** is a common cause of PID and can also lead to complications like **gonococcal arthritis**, which explains the swollen knee.
- Non-adherence to antibiotics could lead to persistent infection, increasing the risk of infertility later on.

108. A young boy, case of ALL, admitted at bone marrow transplant centre for past 2 weeks, developed line related septicaemia. Blood cultures revealed non-lactose fermenter colonies. The next step you would do is:

a. Perform catalase test
b. Perform Gram stain
c. Perform oxidase test
d. Deal isolate as GNR
Key c (Jab bi non lactose fermenting rod aye tou oxidase keren! Takeh pseudomonas baaki NLFs say alag hojaye)

109. Which of the following is an Enterobacterale?

a. Stenotrophomonas maltophilia
b. Pseudomonas aeruginosa
c. Escherichia coli
d. Acinetobacter baumanii
Key c

Explanation:

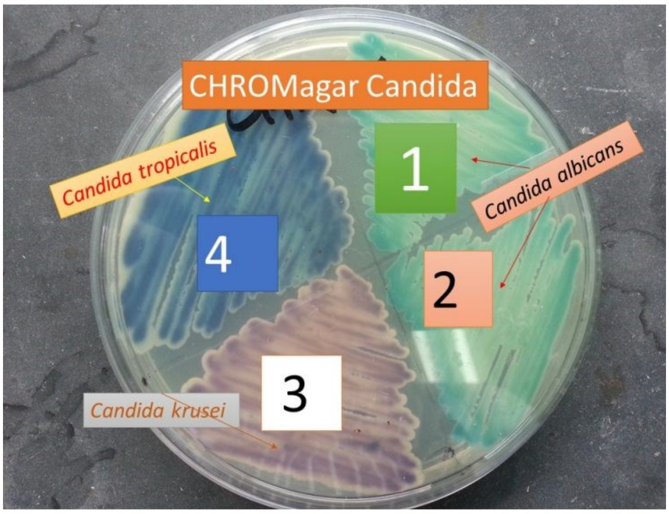
- **Enterobacterales** is an order of bacteria that includes families like **Enterobacteriaceae** (e.g., *Escherichia coli*, *Klebsiella*, *Salmonella*).
- **Escherichia coli** is a classic member of the Enterobacterales group.

110. If there is a delay in urine culture for a few hours, at what temperature should the sample be kept?
a. -20°C
b. 4°C
c. 37°C
d. 25°C
Key b (lekin fridge main bi 24 hours say zyada nai rakhna!)

111. Which organism is indole positive?
a. Escherichia coli
b. Pseudomonas aeruginosa
c. Streptococcus pyogenes
d. Klebsiella pneumoniae
Key a

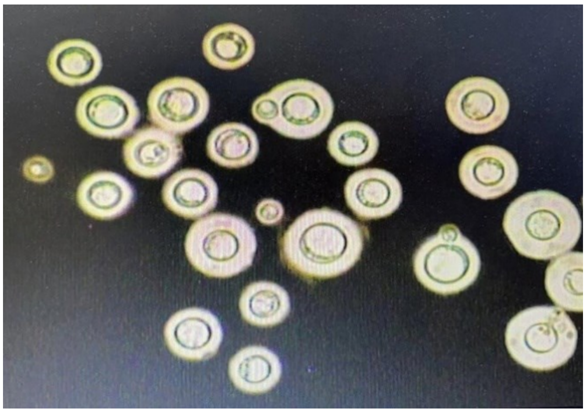
112. Haemophilus influenzae can grow on which of these culture media?
a. MacConkey agar
b. Chocolate agar
c. CLED agar
d. Nutrient agar
Key b

113. Candida albicans gives which colour on chrome agar?
a. Red
b. Violet
c. Blue
d. Green
Key d



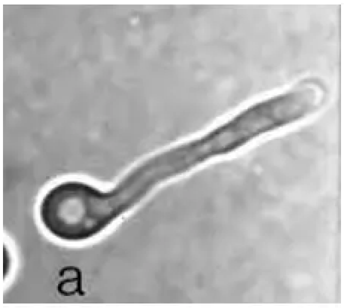
114. Pus cells are best seen on which stain?
a. Gram stain
b. ZN stain
c. Albert stain
d. Silver stain
Key b

115. Which is a negative stain?
a. India ink
b. Albert stain
c. Gram stain
d. Lactophenol cotton blue
Key a (negative stain ka desi matlab hai keh wo background ko stain kerdeta hai main cheez ko stain nai kerta)

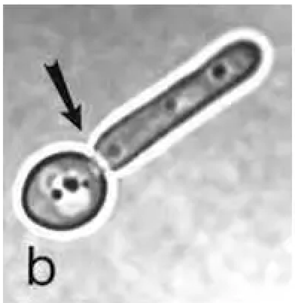


116. Germ tube is a test for:
- a. Gram positive cocci
- b. Gram negative rods
- c. Gram positive rods
- d. Candida species

Key d



A germ tube is an early stage of hyphal (fungal) growth that can be observed in CANDIDA ALBICANS. Constriction yahan nai hogi!



This is germ tube negative. Yahan constriction hogi head aur tail k beech. Candida albicans k ilawa baaki sab candida ki germ tube

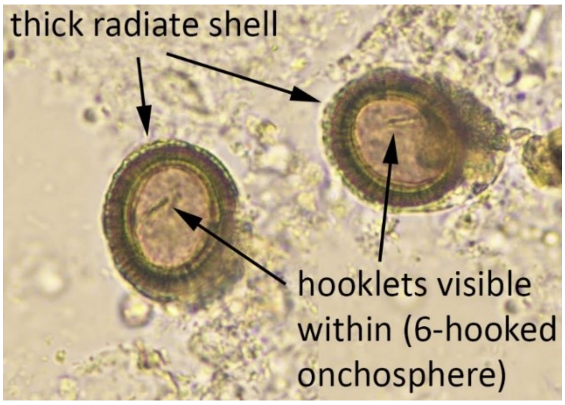
117. CSF sample from shunt related infections needs prolong incubation for:
- a. Staphylococcus aureus
- b. Coagulase negative Staphylococci
- c. Haemophilus influenzae
- d. Propionibacterium acnes

Key d

Propionibacterium acnes (now *Cutibacterium acnes*) WHICH IS ANAEROBE POPULAR IN SHUNT RELATED INFECTIONS requires prolonged incubation (up to 7 days) due to its slow growth rate.

118. A bile-stained, around 45µm, round ovum, with radial striations and an embryo in the centre was seen in stoolsample of a boy. The ovum is likely of which parasite?
- a. Taenia spp
- b. Ascaris lumbricoides
- c. Hookworm
- d. Naegleria fowleri

Key CORRECTED = A



119. Urine sample with 4-5 pus cells/ HPF yielded growth of E.coli. The patient is not symptomatic as such. In which condition should it be treated?
- a. The patient is old aged, >65 years old
- b. The patient is bed bound, having a catheter in place
- c. The patient is pregnant
- d. The patient is a child

Key c

Asymptomatic bacteriuria ki teen treatment indications hain "PUR" mnemonic = Pregnancy, Urological anatomical abnormality/about to undergo Urological procedure, Renal Transplant

120. Pus was aspirated from brain abscess. It should be applied on which media?
- a. Blood, chocolate, Mac Conkey, anaerobic blood agar
- b. Blood, sabouraud, Mac Conkey, anaerobic blood agar
- c. Blood and Mac Conkey agars
- d. Blood and chocolate agars

Key a

Explanation:

- **Blood agar**: Supports the growth of a wide variety of bacteria, including both aerobic and anaerobic organisms, and allows for the observation of hemolysis patterns.
- **Chocolate agar:** Contains lysed red blood cells and supports the growth of fastidious organisms, such as Neisseria and Haemophilus, which require hemoglobin or hemin to grow.
- **MacConkey agar**: Selective for Gram-negative bacteria and allows differentiation of lactose fermenters from non-fermenters.
- **Anaerobic blood agar**: Essential for growing anaerobes, which are often involved in brain abscesses, such as Bacteroides, Fusobacterium spp.

121. Urine for culture should be applied on:
- a. Blood and chocolate agars
- b. Mac Conkey and CLED agars
- c. Blood, chocolate, Mac Conkey, anaerobic blood agar
- d. Blood and CLED agars

Key d

122. Which organism can serve as a negative control for proper anaerobic environment?
- a. Morganella morganii
- b. Escherichia coli
- c. Stenotrophomonas maltophilia
- d. Pseudomonas aeruginosa

Key d (Pseudomonas aeruginosa is a strict AEROBE. It should NOT grow in a well set up anaerobic jar. That's why it's used as a negative control. If asked what is positive control in anaerobic jar then say clostridium perfringens)

123. Which GPR causes necrotizing fasciitis?
- a. Clostridium perfringens
- b. Clostridium tetani
- c. Bacillus anthracis
- d. Corynebacterium diphtheriae

Key a

124. Which isolate is oxidase positive?
- a. Pseudomonas aeruginosa
- b. Burkholderia cepacia
- c. Neisseria gonorrhoeae
- d. Acinetobacter johnsonii

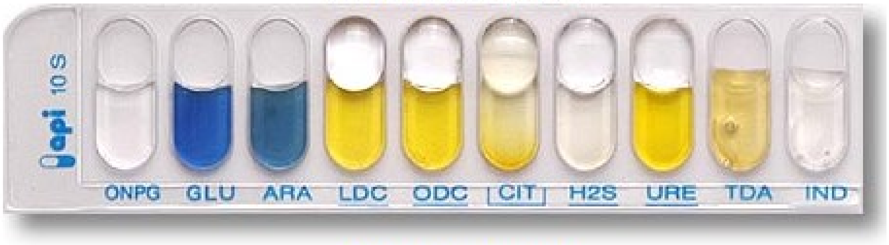
Key CORRECTED = A & C both positive. Pseudomonas is rapid oxidase positive and Burkholderia is late oxidase positive

125. Which isolate is TDA positive?
- a. Escherichia coli
- b. Stenotrophomonas maltophilia
- c. Pseudomonas aeruginosa
- d. Proteus mirabilis

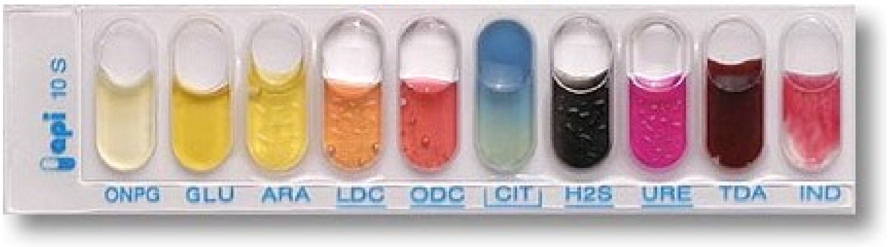
Key d

Remember TDA has three letters. PPM has three letters. So TDM positive = Proteus, Providencia and Morganella

NEGATIVE TESTS



POSITIVE TESTS



126. Bacteria in their log phase of growth cycle exhibit an extremely rapid cell division. What would be the estimated number of bacteria produced from a single cell after 5 generations?

a. 16
b. 32
c. 10^2
d. 10^5
Key b

2^5 = 2 x 2 x 2 x 2 x 2 = 32

127. The culture of pus sample of a 30 years old man from the site of burn yielded growth of pale colonies on MacConkey agar which were found to be catalase positive, oxidase positive, Gram negative rods. The isolate produced greenish pigmentation on blood agar. The isolate is most likely:

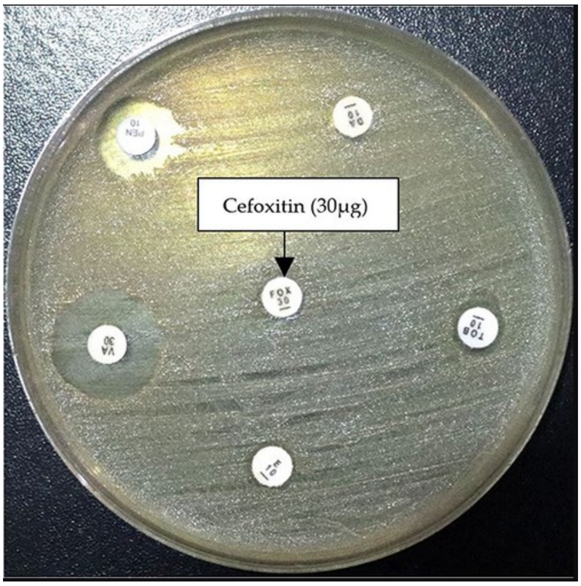
a. Streptococcus bovis
b. Burkholderia cepacia
c. Acinetobacter baumannii
d. Pseudomonas aeruginosa
Key d

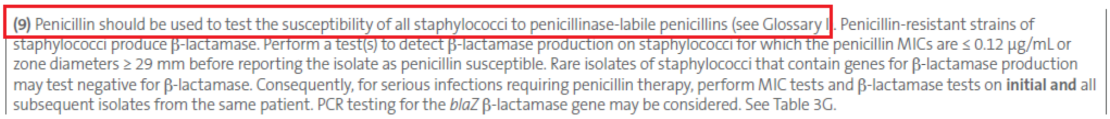
128. A throat swab is received in the microbiology lab for culture from a 6-year-old boy with acute pharyngitis and a greyish adherent membrane in throat. Which additional media will be used for isolation of the causative organism?

a. Chocolate agar
b. 5% sheep blood agar
c. Tellurite blood agar
d. Thayer martin medium
Key c (Corynebacterium diphtheria is a frequently tested topic – The selective medium used for it is Tellurite Blood Agar)

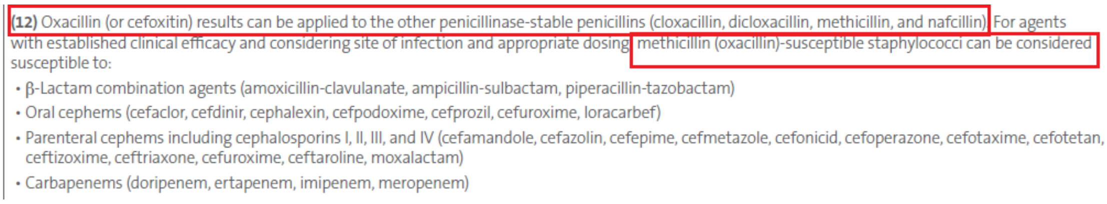
129. Which antibiotics must be applied for reporting of beta lactam drugs in Staphylococcus?

a. Penicillin and augmentin
b. Penicillin and ampicillin
c. Penicillin and methicillin
d. Penicillin and cefoxitin
Key d (VERY IMP CONCEPT)





(9) Penicillin should be used to test the susceptibility of all staphylococci to penicillinase-labile penicillins (see Glossary I). Penicillin-resistant strains of staphylococci produce β-lactamase. Perform a test(s) to detect β-lactamase production on staphylococci for which the penicillin MICs are ≤ 0.12 µg/mL or zone diameters ≥ 29 mm before reporting the isolate as penicillin susceptible. Rare isolates of staphylococci that contain genes for β-lactamase production may test negative for β-lactamase. Consequently, for serious infections requiring penicillin therapy, perform MIC tests and β-lactamase tests on **initial and** all subsequent isolates from the same patient. PCR testing for the *blaZ* β-lactamase gene may be considered. See Table 3G.



(12) Oxacillin (or cefoxitin) results can be applied to the other penicillinase-stable penicillins (cloxacillin, dicloxacillin, methicillin, and nafcillin). For agents with established clinical efficacy and considering site of infection and appropriate dosing, methicillin (oxacillin)-susceptible staphylococci can be considered susceptible to:

- β-Lactam combination agents (amoxicillin-clavulanate, ampicillin-sulbactam, piperacillin-tazobactam)
- Oral cephems (cefaclor, cefdinir, cephalexin, cefpodoxime, cefprozil, cefuroxime, loracarbef)
- Parenteral cephems including cephalosporins I, II, III, and IV (cefamandole, cefazolin, cefepime, cefmetazole, cefonicid, cefoperazone, cefotaxime, cefotetan, ceftizoxime, ceftriaxone, cefuroxime, ceftaroline, moxalactam)
- Carbapenems (doripenem, ertapenem, imipenem, meropenem)

130. Petroff's method is used for:
a. Sterilization of sputum prior to MTB culture
b. Decontamination of sputum prior to MTB culture
c. Decontamination and concentration of sputum prior to MTB culture
d. Concentration of sputum prior to MTB culture
Key c

Collect sputum sample → Add NALC (as a mucolytic agent) and 4% NaOH (as a decontaminant) in 1:1[Decontamination step] → Mix thoroughly
⬇
Stand for 15 minutes at room temperature → Add sterile distilled water or buffer → Neutralize NaOH
⬇
Centrifuge at 3000-4000 g for 15 minutes → Discard supernatant carefully [Concentration step]
⬇
Retain pellet (concentrated mycobacteria) → Inoculate on culture media (e.g., LJ medium) → Incubate at 37°C

131. Kinyoun's method is different from ZN staining because:
a. It requires heat
b. It does not require heat
c. It requires diluted acid
d. It requires concentrated acid
Key (CORRECTED = B)

K for Kinyoun = K for Cold

132. The commonly used method for Petroff in Mycobacterial culture is:
a. NALC NaOH method
b. NALC H2SO4 method
c. NALC Zn method
d. Kinyoun method
Key a (refer to flow chart above)

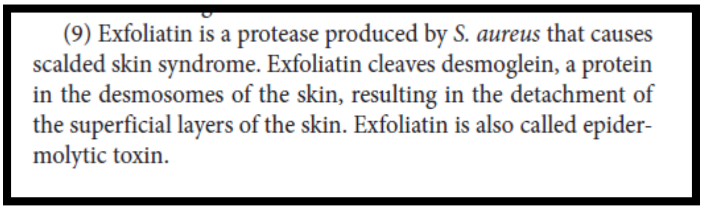
133. MTB is cultured on which medium?
a. Blood agar
b. LJ medium
c. New York city medium
d. Chocolate agar
Key b

134. The procedure of TB culture should be carried out in:
a. HEPA filtered room
b. Biosafety cabinet
c. Laminar flow
d. Bench top in bacteriology lab
Key b

TB is classified as a Biosafety Level 3 (BSL-3) pathogen, which is typically handled in a Class II Biosafety Cabinet

135. ‘’ Scalded – Skin” Syndrome is caused by the action of

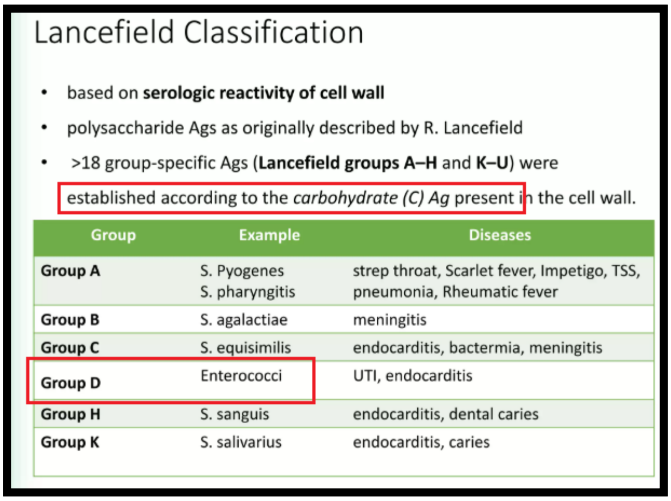
a) Exfoliatin …. staph aureus
b) PV Leukocidin
c) Streptokinase
d) Erythrogenic Toxin
e) Lecithinase
Key a



(9) Exfoliatin is a protease produced by *S. aureus* that causes scalded skin syndrome. Exfoliatin cleaves desmoglein, a protein in the desmosomes of the skin, resulting in the detachment of the superficial layers of the skin. Exfoliatin is also called epidermolytic toxin.

136. On Lance Field grouping, Enterococcus faecalis is a member of group

a) A
b) B
c) C
d) D
e) F
Key d



Lancefield Classification

- based on **serologic reactivity of cell wall**
- polysaccharide Ags as originally described by R. Lancefield
- >18 group-specific Ags (**Lancefield groups A–H** and **K–U**) were established according to the *carbohydrate (C) Ag* present in the cell wall.

Group	Example	Diseases
Group A	S. Pyogenes S. pharyngitis	strep throat, Scarlet fever, Impetigo, TSS, pneumonia, Rheumatic fever
Group B	S. agalactiae	meningitis
Group C	S. equisimilis	endocarditis, bactermia, meningitis
Group D	Enterococci	UTI, endocarditis
Group H	S. sanguis	endocarditis, dental caries
Group K	S. salivarius	endocarditis, caries

137. The mode of transmission of Neisseria meningitides is

a) Direct trauma
b) Airborne droplets
c) Sexual contact
d) Feco-oral route
e) Aerosol
Key b

138. Opisthotonus is seen in infection with

a) Clostridium botulinum
b) Coxiella burnetti
c) Corynebacterium diphtheriae
d) Neisseria meningitides
e) Clostridium tetani
Key e

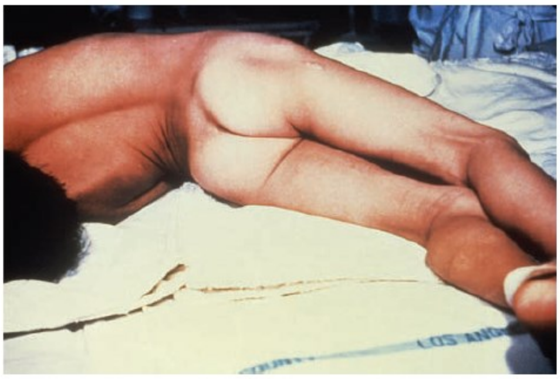


FIGURE 17–4 Tetanus. Note the marked hyperextension of the back, a position called *opisthotonos*, caused by tetanus toxin, an exotoxin that inhibits the release of mediators of the inhibitory neurons in the spinal cord. (Source: Centers for Disease Control and Prevention. CDC # 6373.)

139. The agent that can be transmitted by the ingestion of reheated fried rice is

a) Escherichia coli
b) Staphylococcus aureus
c) Bacillus cereus
d) Vibrio cholerae
e) Clostridium perfringens

Key c (Bohat favourite PET MCQ)

140. 'Traveller's diarrhea' is caused by

a) Salmonella enteritides
b) Escherichia coli
c) Vibrio cholerae
d) Shigella Dysenteriae
e) Staphylococcal enterotoxin

Key b (Notably the Enterotoxigenic strain! T for Traveller's diarrhea, T for enteroToxigenic)

141. Peyer's Patches in the ileum are involved in the pathogenesis of

a) Brucella melitensis
b) Francisella tularensis
c) Vibrio parahemolyticus
d) Salmonella typhi
e) Shigella dysenteriae

Key d (bohat favourite MCQ!)

142. The selective medium for culturing vibrio cholerae is

a) TCBS
b) BCYE
c) Thayer Martin medium
d) CLED
e) Skirrow's

Key a

143. The bacteria most likely to withstand disinfectants and may also grow in antiseptics is

a) Escherichia coli
b) Acinetobacter baumanii
c) Pseudomonas aeruginosa
d) MRSA
e) Klebsiella Pneumoniae

Key c

144. Sinusitis and otitis media are most frequently caused by

a) Hemophilus influenzae
b) Streptococcus pyogenes
c) Legionella pneumophila
d) Bordetella pertussis
e) Listeria monocytogenes

Key a

If Streptococcus pneumoniae was an option, it would be the best choice as it is also a leading cause of both sinusitis and otitis media, particularly in young children.

145. The microbial carcinogen associated with gastric carcinoma is

a) Campylobacter jejuni
b) Streptococcus bovis
c) Enterococcus faecium
d) Helicobacter pylori
e) Streptococcus bovis

Key d

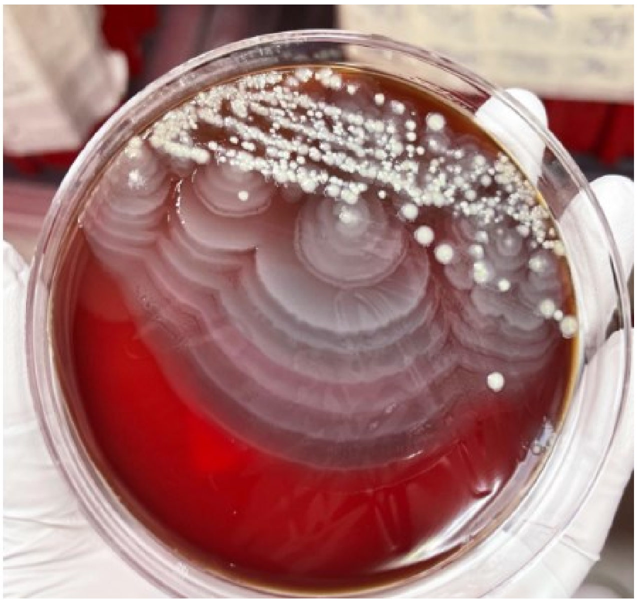
Microbiology main kuch hi cancers hain. Unka ratta maar len.
Bladder cancer = Schistosoma hematobium
Gastric cancer = H pylori
Gallbladder cancer = Chlonorchis sinensis (liver fluke)
Aflatoxin of Aspergillus flavus = HCC

146. Red pigmented colonies are produced by
- a) Klebsiella pneumoniae
- b) Escherichia coli
- c) Vibrio vulmificus
- d) Prevotella melaninogenica
- e) Serratia marscesens

Key e (PIGMENT NAME = PRODIGIOSIN)

147. The phenomenon of 'swarming' on blood agar plate is caused by
- a) Salmonella typhi
- b) Proteus mirabilis
- c) Escherichia coli
- d) Pseudomonas aeruginosa
- e) Enterococcus faecalis

Key b



148. Bordetella pertussis is the causative agent of
- a) Undulant fever
- b) Cat scratch disease
- c) Hansen's disease
- d) Whooping cough
- e) Plasma cell pneumonia

Key d

Bordetella ki following hints yaad rakhen:

Pathogenesis: Pertussis toxin adenylate cyclase cAMP wala chakkar kerke galay main edema kerta

Clinical Features: HUNDRED DAY COUGH KI HINT DE SAKTA. Bordetella pertussis causes whooping cough, characterized by a paroxysmal cough and a high-pitched "whoop" sound on inhalation. The disease progresses through catarrhal, paroxysmal, and convalescent stages.

Lymphocytosis: Na keh baaki bacteria ki tra neutrophilia! One key feature of Bordetella pertussis infection, particularly in the paroxysmal phase, is the presence of marked lymphocytosis (elevated lymphocyte count) in the blood, which is often noted in the lab workup.

Culture medium: Bordet-Gengou Agar

Transmission: Bordetella pertussis is transmitted via aerosolized droplets, primarily affecting children, especially those who are unvaccinated.

149. Brucella melitensis infection chiefly affects the ....system.
- a) Genito-urinary
- b) Respiratory
- c) Cardiovascular
- d) Reticulo- endothelial
- e) Endocrine

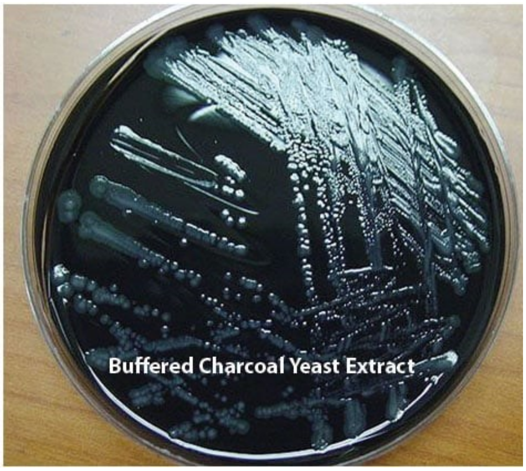
Key d

Brucella melitensis primarily affects the reticulo-endothelial system, which includes the liver, spleen, lymph nodes, and bone marrow. Unpasteurized milk ki association yaad rakhen! Brucellosis is a zoonotic infection that typically presents with fever, malaise, and organ involvement, especially the liver and spleen. It can also affect bones and joints in chronic cases.

150. Blood charcoal yeast extract (BCYE) agar is used to grow
- a) Hemophilus parainfluenzae
- b) Streptococcus pneumoniae
- c) Bordetella pertussis
- d) Yersinia pestis
- e) Legionella pneumophila

Key e

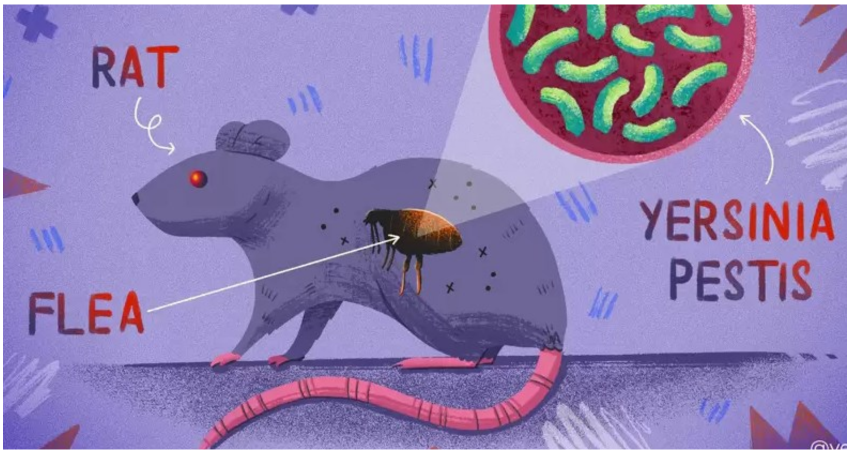
M813
Legionella pneumophila
33153


Buffered Charcoal Yeast Extract

151. Plague is caused by
- a) Yersinia pestis
- b) Mycobacterium leprae
- c) Clostridium perfringens
- d) Coxiella burnetti
- e) Bartonella henselae

Key a

Yersinia pestis is the causative agent of plague, which is primarily transmitted to humans through flea bites from infected rodents. It can present in various forms, including bubonic, septicemic, and pneumonic plague.

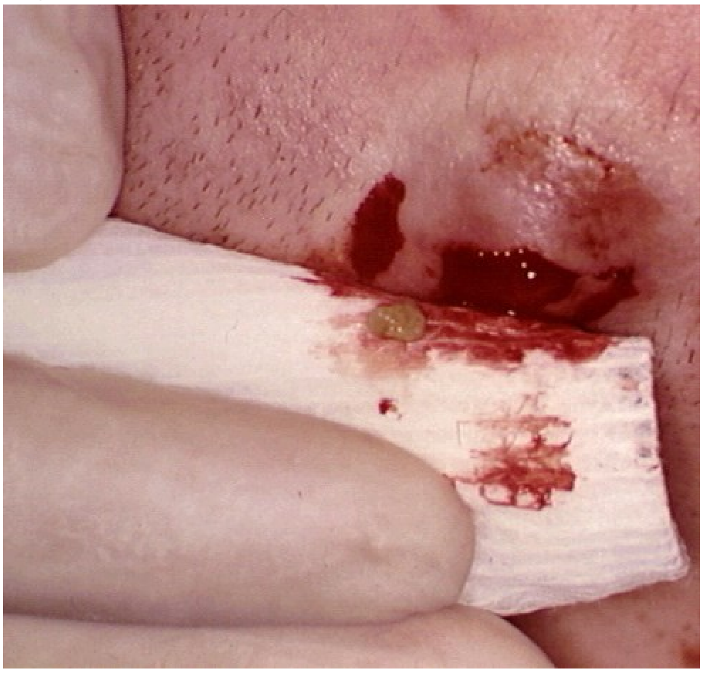

RAT
FLEA
YERSINIA PESTIS

152. The mycobacteria that can be transmitted through the ingestion of unpasteurized milk is
- a) Kansasi
- b) Fortuitum
- c) Bovis
- d) Chelonae
- e) Avium

Key c

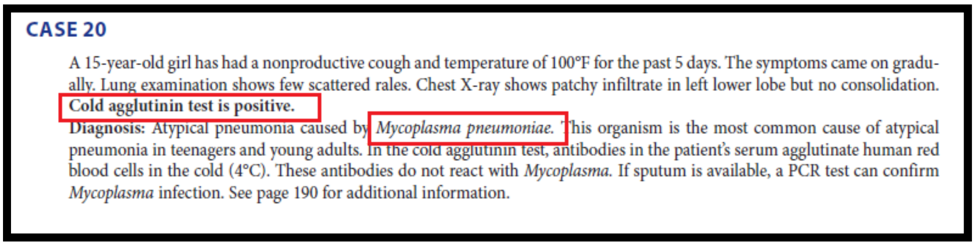
153. ‘‘Sulfur granules’’ seen in pus are pathogonomic for abscess caused by
- a) Staphylococcus aureus
- b) Actinomyces israelii
- c) Pseudomonas aeruginosa

d) Nocardia asteroides
e) Prevotella melaninogenica
Key b



154. ‘’ Cold Agglutinins” are a diagnostic criterion for
a) Listeria monocytogenes
b) Streptococcus pneumoniae
c) Legionella pneumophila
d) Chlamydia psittaci
e) Mycoplasma pneumoniae
Key e

Cold agglutinins are antibodies that cause red blood cells (RBCs) to clump together (agglutinate) when exposed to lower temperatures, typically around 4°C. These antibodies are typically IgM and are most commonly associated with certain infections. Their presence can be used as a diagnostic clue for various diseases, particularly Mycoplasma pneumoniae.



CASE 20

A 15-year-old girl has had a nonproductive cough and temperature of 100°F for the past 5 days. The symptoms came on gradually. Lung examination shows few scattered rales. Chest X-ray shows patchy infiltrate in left lower lobe but no consolidation. **Cold agglutinin test is positive.**

Diagnosis: Atypical pneumonia caused by *Mycoplasma pneumoniae.* This organism is the most common cause of atypical pneumonia in teenagers and young adults. In the cold agglutinin test, antibodies in the patient's serum agglutinate human red blood cells in the cold (4°C). These antibodies do not react with *Mycoplasma.* If sputum is available, a PCR test can confirm *Mycoplasma* infection. See page 190 for additional information.

155. Syphilis is caused by
a) Chlamydia trachomatis
b) Treponema pallidum
c) Haemophilus Ducreyi
d) Nocardia Asteroides
e) Staphylococcus Saprophyticus
Key b

156. An important reservoir for Chlamydia psittaci is
a) Starlings
b) Mallard Ducks
c) Parrots
d) Sparrows
e) Storks
Key c (Bird keeper/parrot pigeon keeper ki hint hogi scenario main!)

Chlamydia psittaci is the causative agent of psittacosis (also known as parrot fever), and its primary reservoir is often parrots and other psittacine birds (such as cockatoos and macaws). The bacteria can be transmitted to humans through direct contact with infected birds or inhalation of dried bird droppings, feathers, or secretions containing the bacteria.

157. Q Fever is caused by

a) Bartonella henselae
b) Ehrlichia Chafeensis
c) Brucella Abortus
d) Coxiella burnetii
e) Rickettsia TsuTsugamushi
Key d

158. Lyme disease is caused by

a) Rickettsia prowazeckii
b) Leptospira interrogans
c) Coxiella burnetti
d) Rickettsia rickettsi
e) Borrelia burgdoferi
Key e

Imp baatein: Lyme disease is caused by the spirochete bacterium *Borrelia burgdorferi*. It is transmitted to humans through the bite of infected black-legged ticks (commonly Ixodes scapularis). TARGET RASH

159. Lymphogranuloma venereum is caused by

a) Chlamydia trachomatis
b) Treponema pallidum
c) Neisseria gonorrhoae
d) Hemophilus Ducreyi
e) Gardenerella vaginalis
Key a

Serotype	**Disease**
A, B, C	Trachoma (chronic conjunctivitis, leading to blindness)
D-K	Nongonococcal Urethritis (NGU) Cervicitis PID Neonatal Conjunctivitis Neonatal Pneumonia
L1, L2, L3	Lymphogranuloma Venereum (LGV)

160. The agent that can be transmitted by the bite of a domestic dog is

a) Eikinella corrodens
b) Bartonella henselae
c) Francisella tularensis
d) Pasteurella multocida
e) Leptospira interrogans
Key d

Cat bite / Dog bite = Pasteurella multocida
Cat Scratch = Bartonella henselae

161. Ventilator associated pneumonia is most frequently caused by

a) Chlamydia pneumophila
b) Acinetobacter baumanii **Formatting error**(gram negative, oxidase negative
c) Streptococcus pneumoniae
d) Neisseria meningitides

e) Hemophilus influenzae

Key b

(Acinetobacter baumanii is gram-negative, oxidase-negative, non-motile)

162. Cellulitis seen in shellfish handlers is most likely caused by

a) Mycobacterium marinum
b) Clostridium Welchii
c) Vibrio vulnificus
d) Rickettsia Akari
e) Actinomyces israelii

Key c

Vibrio vulnificus is a halophilic gram-negative bacillus commonly found in saltwater environments and associated with seafood-related infections. It is the most likely cause of cellulitis in shellfish handlers due to direct exposure to raw seafood or contaminated seawater.

163. Non lactose fermenter gram negative rod that does not produce H2S is

a) Proteus mirabilis
b) Salmonella typhimurium
c) Salmonella Paratyphi A
d) Shigella dysenteriae
e) Proteus vulgaris

Key d (CORRECTION = BOTH C and D are correct…MCQ stem is wrong)

164. Cold Enhancement technique is used to accelerate the growth of

a) Listeria monocytogenes
b) Bordetella pertussis
c) Mycoplasma pneumoniae
d) Corynebacterium diphtheriae
e) Legionella pneumophila

Key a

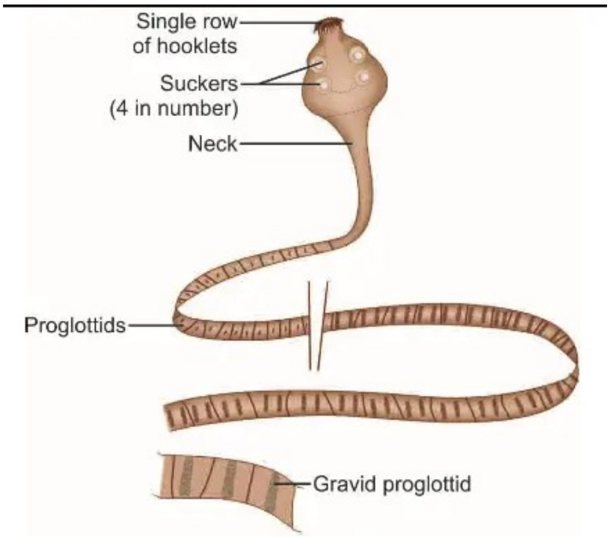
165. Dwarf tape worm is another name for

a) entrobius vermicularis
b) strongyloides stercoralis
c) hymenolepis nana
d) trichuris trichura
e) dracunculus medinensis

Key c

N for Nano (small) = Hymenolepis NANA
If asked largest tapeworm then choose "Diphylobothrium latum"
(fish tapeworm)

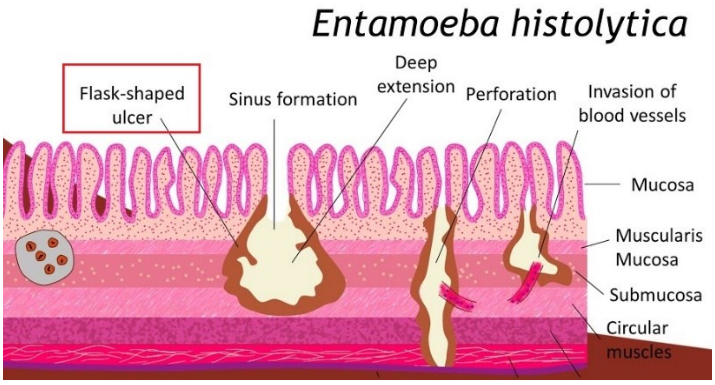
General tapeworm structure concept:



166. Flask shaped ulcers in a biopsy specimen of intestine are found in case of

a) Enterocytozoon bineusii
b) Balantidium coli
c) Cryptosporidium parvum
d) Entamoeba histolytica
e) Giardia lamblia

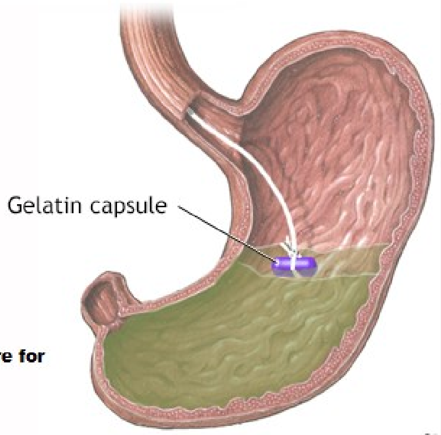
Key d


Entamoeba histolytica
Flask-shaped ulcer
Sinus formation
Deep extension
Perforation
Invasion of blood vessels
Mucosa
Muscularis Mucosa
Submucosa
Circular muscles

167. String test is done as a diagnostic test to visualize trophozoites of

a) Enterobius Vermicularis
b) Giardia lamblia
c) Cryptosporidium parvum
d) Ascaris lumbricoides
e) Entamoeba histolytica

Key b

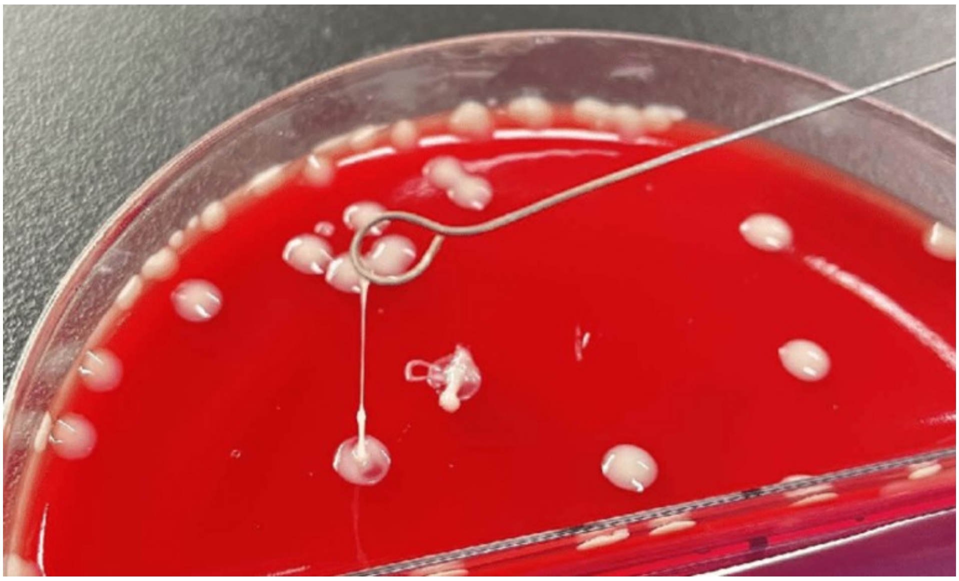

Gelatin capsule

The string test (also called the Entero-Test) is a diagnostic procedure for Giardia lamblia infection.

How it Works:
The patient swallows a gelatin capsule containing a nylon string with one end taped to the cheek.
The capsule dissolves in the stomach, and the string extends into the duodenum.
After several hours (typically 4–6), the string is withdrawn, and mucus and duodenal fluid on it are examined under a microscope.

Purpose:
Used to detect Giardia trophozoites or cysts in patients with persistent diarrhea when stool tests are inconclusive.

Don't confuse with the following string test in Klebsiella pneumoniae:



168. Black water fever is caused by plasmodium
- a) Malariae
- b) Ovale
- c) Falciparum
- d) Vivax
- e) Lavernae

Key c

169. Plasma cell pneumonia is caused by
- a) Trypanasoma cruzi
- b) Paragonimus westermani
- c) Onchocerca volvulus
- d) Strongyloides stercoralis
- e) Pneumocystis jirovecii/carinii

Key e

[Ground glass appearance bi Pneumocystis keh liyay yaad rakhen!]

170. The microbial carcinogen associated with the risk of urinary bladder carcinoma is
- a) Schistosoma mansoni
- b) Clonorchis sinensis
- c) Schistosoma haematobium
- d) Paragonimus westermani
- e) Schistosoma japonicum

Key c

171. The biological name of the lung fluke is
- a) Isospora belli
- b) Paragonimus westermani
- c) Clonerchis sinensis
- d) Onchocerca volvulus
- e) Wuchereira bancrofti

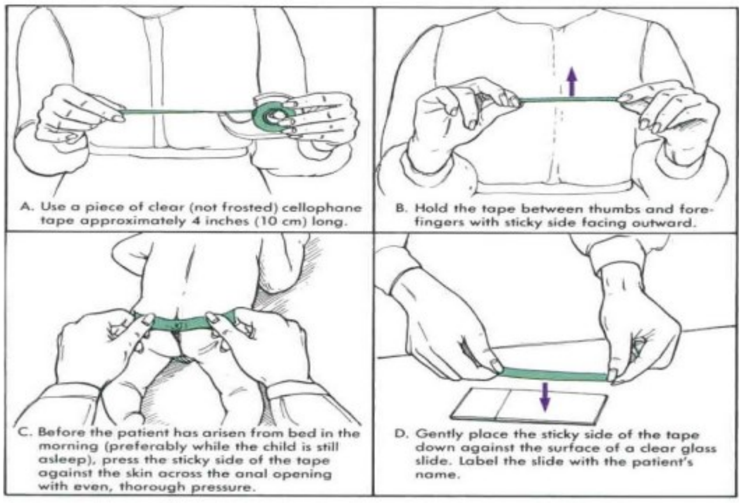
Key b

- **Paragonimus westermani (*Lung fluke*) – Affects lungs.**
- **Clonorchis sinensis (*Chinese liver fluke*) – Biliary tree; cholangiocarcinoma.**
- **Opisthorchis viverrini (*Southeast Asian liver fluke*) – Similar to *Clonorchis*.**
- **Fasciola hepatica (*Sheep liver fluke*) – Liver and bile ducts.**
- **Fasciolopsis buski (*Giant intestinal fluke*) – Small intestine.**

Schistosomes – Blood flukes
- **Schistosoma haematobium – Urinary tract; bladder cancer.**

172. The ‘scotch tape’ technique is used in the laboratory diagnosis of
- a) Giardia lamblia
- b) Trichuris trichura
- c) Ascaris lumbricoides
- d) Entamoeba histolytica
- e) Enterobius vermicularis

Key e



A. Use a piece of clear (not frosted) cellophane tape approximately 4 inches (10 cm) long.

B. Hold the tape between thumbs and forefingers with sticky side facing outward.

C. Before the patient has arisen from bed in the morning (preferably while the child is still asleep), press the sticky side of the tape against the skin across the anal opening with even, thorough pressure.

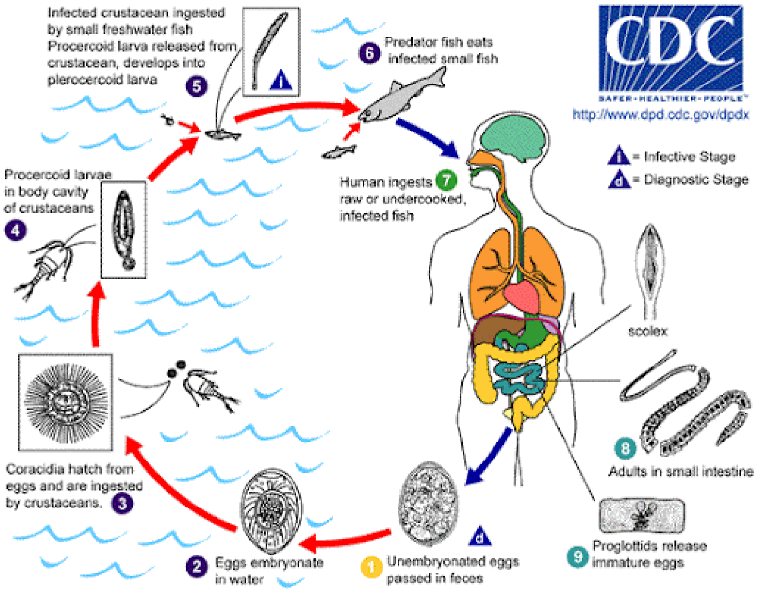
D. Gently place the sticky side of the tape down against the surface of a clear glass slide. Label the slide with the patient's name.

FIGURE 52-4 Method for collection of a cellophane (Scotch) tape preparation for pinworm diagnosis. This method dispenses with the tongue depressor, requiring only tape and a glass microscope slide. The tape must be pressed deep into the anal crack.

173. The intermediate host of Diphyllobothrium latum is

a) Human
b) Pig
c) Cattle
d) Fish
e) Dog
Key d

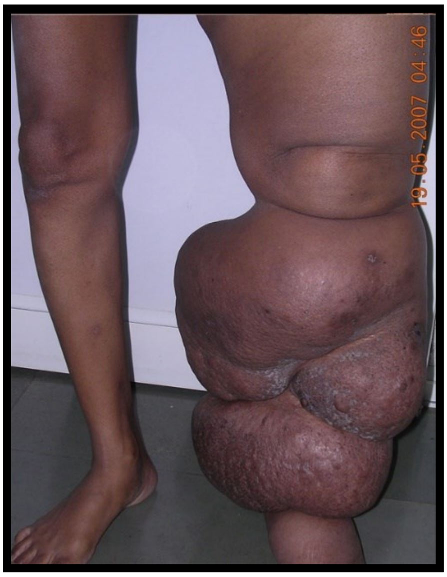
Definitive host is human!


Infected crustacean ingested by small freshwater fish Procercoid larva released from crustacean, develops into plerocercoid larva ⑤
⑥ Predator fish eats infected small fish
CDC
SAFER·HEALTHIER·PEOPLE
http://www.dpd.cdc.gov/dpdx
i = Infective Stage
d = Diagnostic Stage
i
Human ingests ⑦ raw or undercooked, infected fish
Procercoid larvae in body cavity of crustaceans ④
scolex
⑧ Adults in small intestine
Coracidia hatch from eggs and are ingested by crustaceans. ③
d
⑨ Proglottids release immature eggs
② Eggs embryonate in water
① Unembryonated eggs passed in feces

174. Elephantiasis is caused by

a) Wuchereira bancrofti
b) Onchocerca volvulus
c) Loa Loa
d) Clonerchis sinensis
e) Dracunculus medinensis
Key a

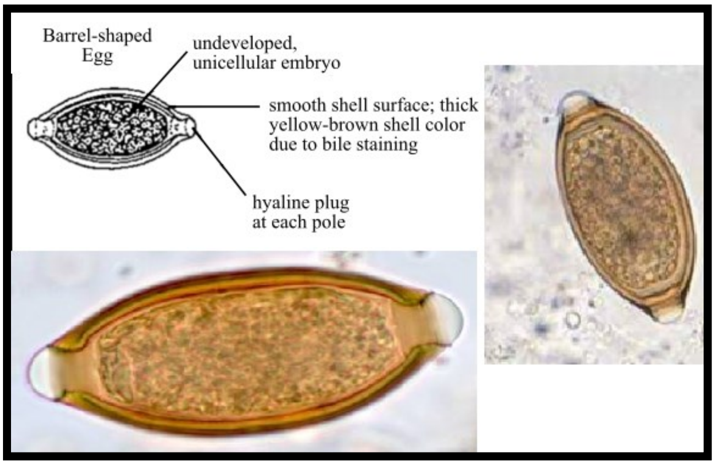
Elephantiasis (also known as lymphatic filariasis) is caused by infection with **Wuchereria bancrofti**, a type of **filarial worm**. The infection leads to the obstruction of lymphatic vessels, resulting in severe swelling, particularly of the legs and genital area.


19.05.2007 04:46

175. Lemon-shaped eggs with plugs at both ends seen in a stool specimen are diagnostic for infection with

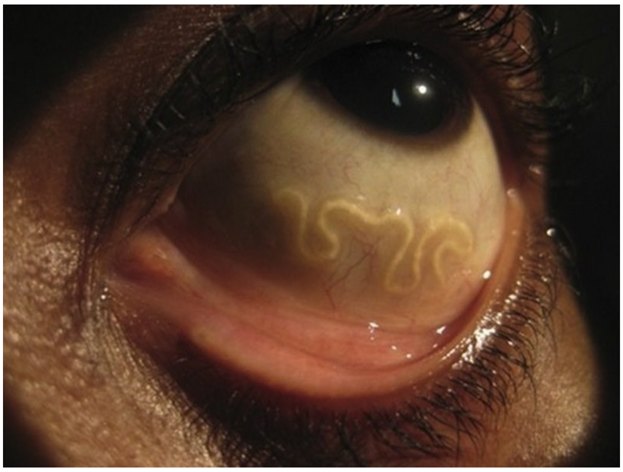
a) Trichuris trichura
b) Strongyloides stercoralis
c) Ascaris lumbricoides
d) Trichinella spiralis
e) Enterobius vermicularis
Key a

✶ **Don’t forget = Trichuris trichura complication = RECTAL PROLAPSE!**


Barrel-shaped Egg
undeveloped, unicellular embryo
smooth shell surface; thick yellow-brown shell color due to bile staining
hyaline plug at each pole

176. Loa Loa is transmitted by the bite of infected

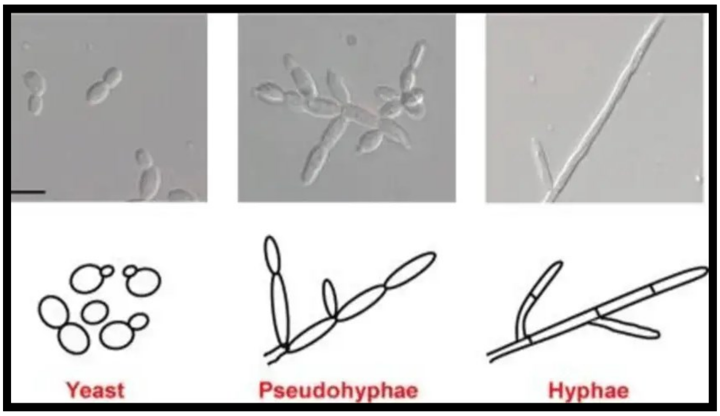
a) Mango Fly
b) Culex mosquito
c) Black fly
d) Aedes mosquito
e) Tse Tse fly
Key a (also called deer fly!!)

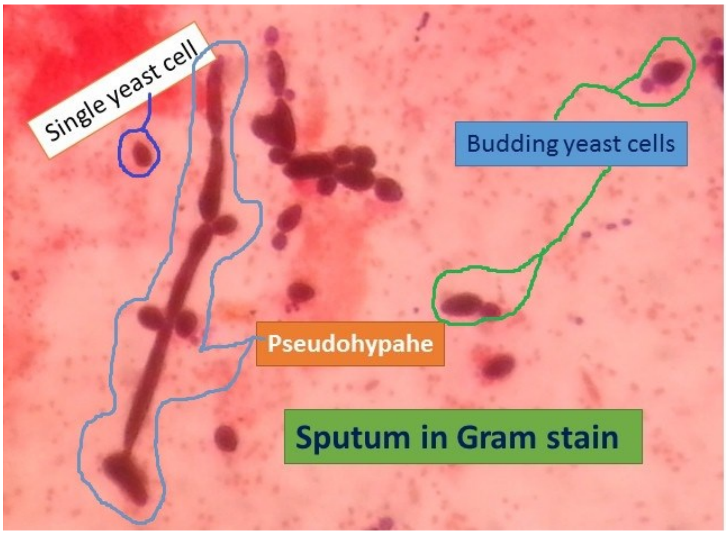


177. Pseudohyphae seen in tissue specimens are diagnostic for infection with

a) Aspergillus fumigatus
b) Cryptococcus neoformans
c) Penicillium marneffei
d) Candida albicans
e) Fusarium solani
Key d

Pseudohyphae are a hallmark of Candida albicans. They are intermediate forms between yeast cells and true hyphae and appear as elongated, budding cells connected by constrictions.


Yeast
Pseudohyphae
Hyphae

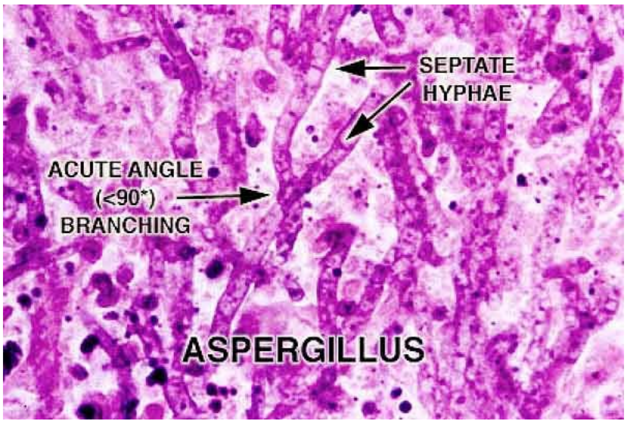

Single yeast cell
Budding yeast cells
Pseudohypahe
Sputum in Gram stain

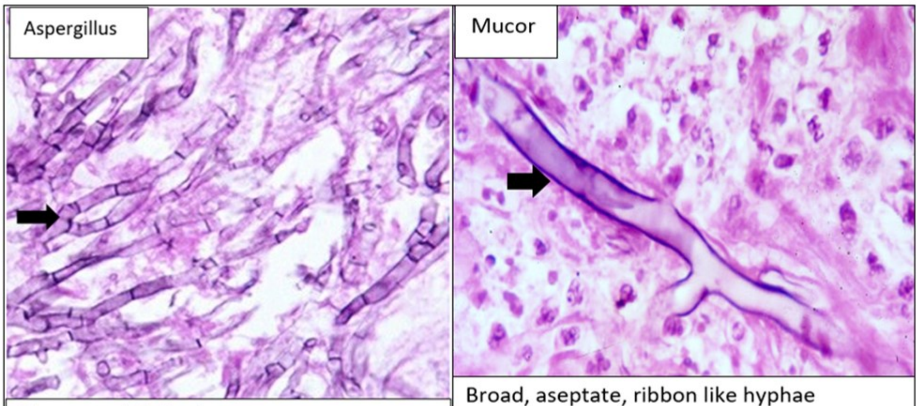
178. Septate hyphae having parallel walls that form V-shaped branches are seen in

a) Aspergillus fumigatus
b) Rhizopus arrhizus
c) Penicillium marneffei
d) Sporothrix schenkii
e) Coccidiodes immitis

Key a

A for Aspergillus = A for Acute branching!


SEPTATE HYPHAE
ACUTE ANGLE (<90°) BRANCHING
ASPERGILLUS


Aspergillus
Mucor

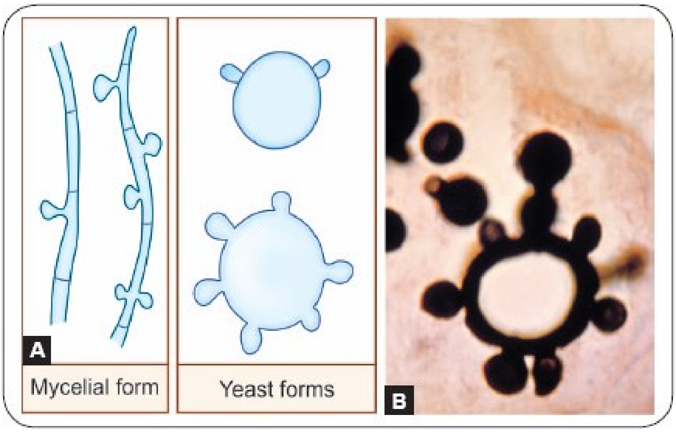
Narrow, septate hyphae
Acute angled branching
Image: microbeonline.com (h&e)

Broad, aseptate, ribbon like hyphae
Right angled branching
Image: mynotesforusmle.tumblr.com (h&e)

179. If a pus or tissue specimen culture yields yeast cells with multiple buds resembling a “ship captain’s wheel” appearance, the most likely diagnosis is

a) Histoplasma capsulatum
b) Blastomyces dermatidis
c) Sporothrix schenkii
d) Coccidiodes immitis
e) Paracoccidioides braziliensis

Key e

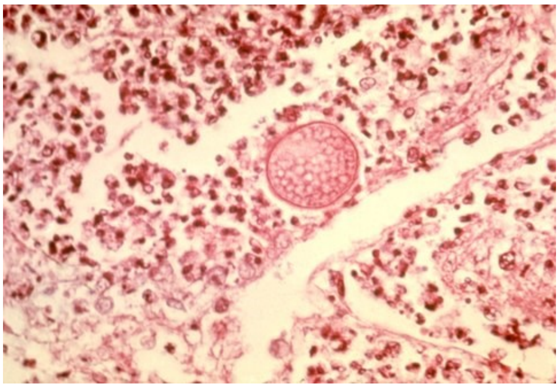


180. Spherules seen in pulmonary tissue specimens are a diagnostic criterion for infection with

a) Coccidiodes immitis
b) Histoplasma capsulatum
c) Sporothrix schenkii
d) Paracoccidiodes braziliensis
e) Blastomyces dermatidis

Key a

Spherules are a diagnostic feature of *Coccidioides immitis* infection. These are large, round structures found in tissue specimens, particularly in the lungs, and are filled with endospores. *Coccidioides immitis* is the causative agent of coccidioidomycosis, also known as Valley fever.



181. ‘Rose gardener’s disease’ is caused by

a) Blastomyces dermatidis
b) Histoplasma capsulatum
c) Sporothrix schenkii
d) Paracoccidiodes braziliensis
e) Coccidiodes immitis

Key c

182. In a known case of invasive Aspergillosis, the risk of developing Hepatocellular carcinoma is due to the production of

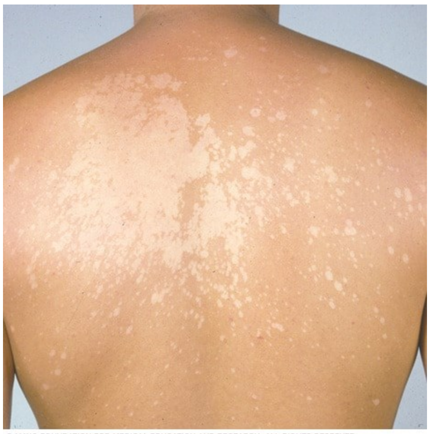
a) Afla toxin
b) Beta toxin
c) Tetrado toxin

d) Gamma toxin
e) Alpha toxin
Key a

Aflatoxins are toxic metabolites produced by certain species of *Aspergillus*, particularly *Aspergillus flavus*. Aflatoxins are carcinogenic and can increase the risk of hepatocellular carcinoma (HCC), especially in individuals with compromised liver function.

183. The stain used in the laboratory to identify the capsule of Cryptococcus neoformans is
a) Auramine red
b) Albert
c) Lactophenol cotton blue
d) India ink
e) Giemsa
Key d

184. Tinea versicolor is caused by
a) Epidermophyton floccosum
b) Trichophyton tonsurans
c) Microsporum canis
d) Cladosporium werneckii
e) Malassezia furfur
Key e



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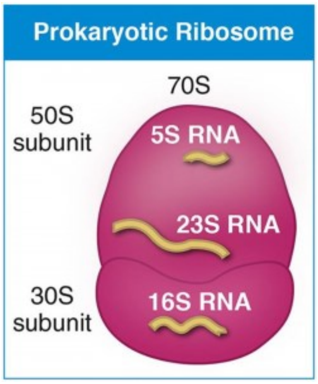
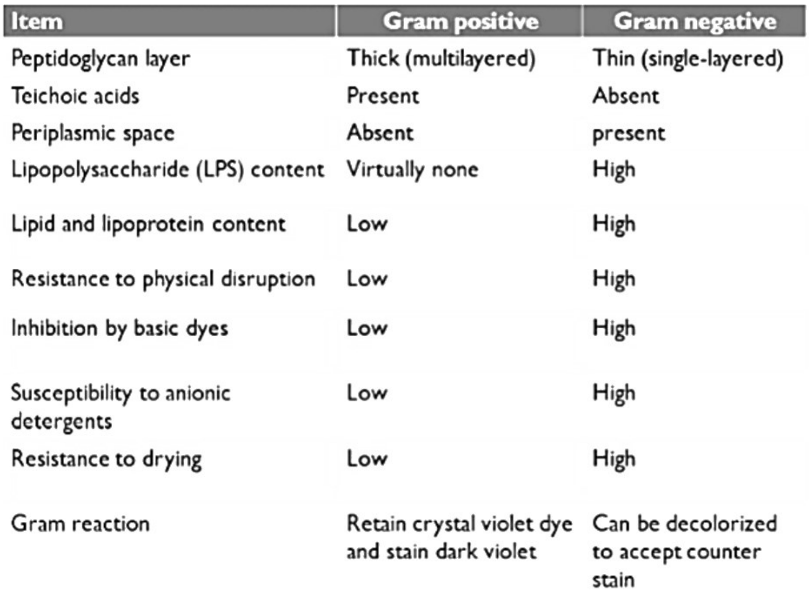
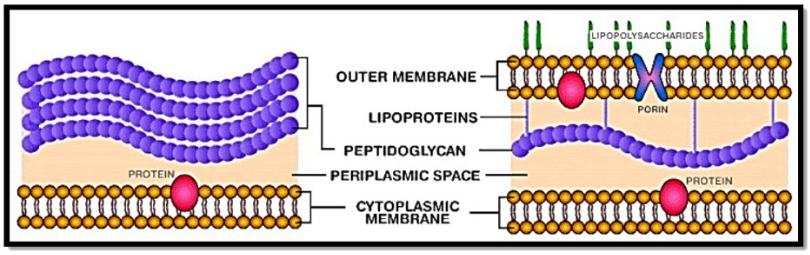
185. 70 S ribosomes are present in
a) viruses
b) bacteria
c) protozoa
d) fungi
e) helminths
Key b



186. An important structural component of the cell wall of gram-negative bacteria is
a) lipopolysaccharide layer
b) lipoteichoic acid
c) very thick peptidoglycan layer
d) mycolic acid
e) D-glutamate
Key a



Item	Gram positive	Gram negative
Peptidoglycan layer	Thick (multilayered)	Thin (single-layered)
Teichoic acids	Present	Absent
Periplasmic space	Absent	present
Lipopolysaccharide (LPS) content	Virtually none	High
Lipid and lipoprotein content	Low	High
Resistance to physical disruption	Low	High
Inhibition by basic dyes	Low	High
Susceptibility to anionic detergents	Low	High
Resistance to drying	Low	High
Gram reaction	Retain crystal violet dye and stain dark violet	Can be decolorized to accept counter stain


LIPOPOLYSACCHARIDES
OUTER MEMBRANE
PORIN
LIPOPROTEINS
PEPTIDOGLYCAN
PROTEIN
PERIPLASMIC SPACE
PROTEIN
CYTOPLASMIC MEMBRANE

Gram-positive bacteria Gram negative bacteria

187. Example of a wall-less organism is

a) Treponema pallidum
b) mycobacterium tuberculosis
c) Yersinia pestis
d) mycoplasma pneumoniae
e) nocardia asteroids

Key d

188. Dental plaque is formed by

a) staphylococcus aureus
b) streptococcus pyogenes
c) streptococcus mutans
d) streptococcus mitis
e) staphylococcus epidermidis

Key c

189. Penicillins act by inhibiting

a) synthesis of B-glucan
b) bacterial DNA synthesis
c) bacterial RNA synthesis
d) peptidyl transferase
e) transpeptidase

Key e

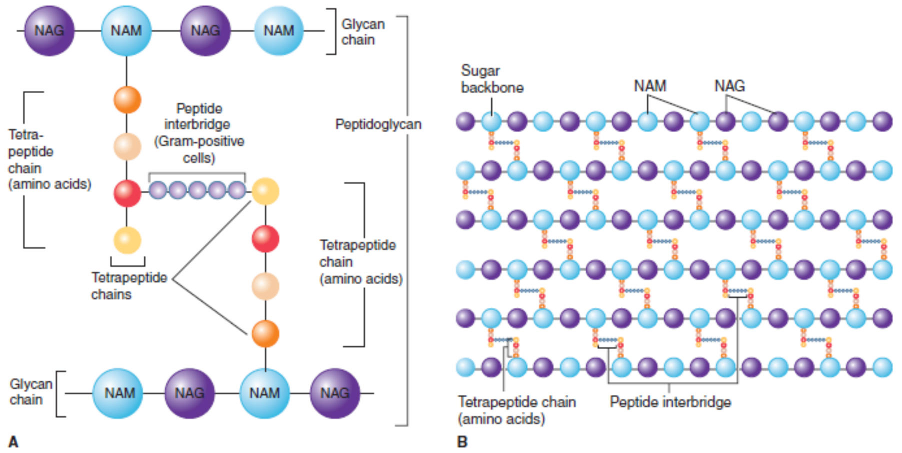

NAG
NAM
NAG
NAM
Glycan chain
Tetra-peptide chain (amino acids)
Peptide interbridge (Gram-positive cells)
Peptidoglycan
Tetrapeptide chains
Tetrapeptide chain (amino acids)
Glycan chain
NAM
NAG
NAM
NAG
A
Sugar backbone
NAM
NAG
Tetrapeptide chain (amino acids)
Peptide interbridge
B

FIGURE 2–5 Peptidoglycan structure. **A:** Peptidoglycan is composed of a glycan chain (NAM and NAG), a tetrapeptide chain, and a cross-link (peptide interbridge). **B:** In the cell wall, the peptidoglycan forms a multilayered, three-dimensional structure. NAG, *N*-acetylglucosamine; NAM, *N*-acetylmuramic acid. (Reproduced with permission from Nester EW et al. *Microbiology: A Human Perspective.* 6th ed. New York, NY: McGraw-Hill; 2009.)

190. Solutions for intravenous use are made “pyrogen-free” by subjecting them to ------------- before autoclaving them.

a) pasteurization
b) ultraviolet light
c) chlorine
d) filtration
e) ethylene oxide

Key d (Remember filtration > radiation)

191. Wound culture of a patient yielded golden yellow colonies on blood agar. They were gram positive cocci in grape-like clusters. The most likely diagnosis is:

a) Staphylococcus aureus
b) Streptococcus agalactiae
c) Staphylococcus epidermidis
d) streptococcus pyogenes
e) staphylococcus saprophyticus

Key a

192. The organisms that lack cytoplasm and require host cells for protein synthesis are

a) virus
b) protozoa
c) bacteria
d) fungi
e) helminths

Key a

193. ‘Jumping Genes’ is another term for

a) bacteriophage
b) ribosomes
c) transposons
d) plasmids
e) nucleoid

Key c

194. The cell wall structural component that plays the role of endotoxin in gram negative organisms is

a) peptidoglycan
b) lipopolysaccharide
c) murein

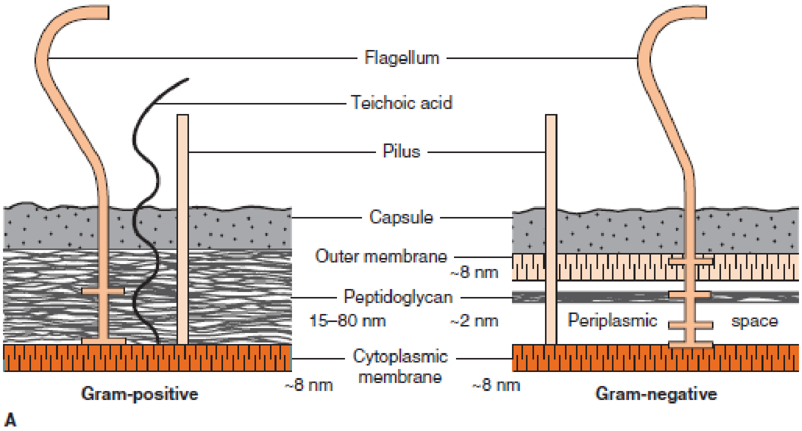
d) lipoteichoic acid
e) teichoic acid
Key b

195. The bacterial structure that helps retard phagocytosis by host inflammatory cells is

a) capsule
b) pili
c) flagella
d) glycocalyx
e) fimbriae
Key a

196. Beta lactamases are found in the bacterial

a) polysaccharide capsule
b) outer membrane
c) periplasmic space
d) teichoic acid
e) pilus
Key c

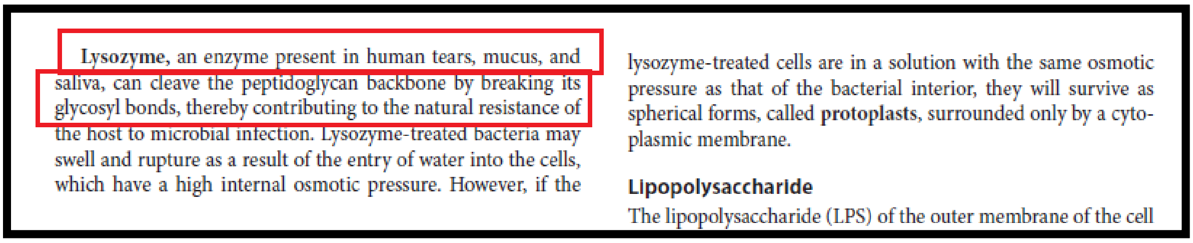

Flagellum
Teichoic acid
Pilus
Capsule
Outer membrane
~8 nm
Peptidoglycan
15–80 nm
~2 nm
Periplasmic space
Cytoplasmic membrane
~8 nm
~8 nm
Gram-positive
Gram-negative
A

197. An example of a strict anaerobe is 1. The organs of motility in bacteria **FORMATTING ERROR**

a) pseudomonas aeruginosa
b) morganella morganii
c) enterobacter cloacae
d) bacteroides fragilis
e) klebsiella pneumoniae
Key d

198. The enzyme presents in human tears, mucus & saliva that can cleave peptidoglycan backbone is

a) PV leukocidin
b) lactoferrin
c) metalloproteinase
d) lysozyme
e) protease IV
Key d



Lysozyme, an enzyme present in human tears, mucus, and saliva, can cleave the peptidoglycan backbone by breaking its glycosyl bonds, thereby contributing to the natural resistance of the host to microbial infection. Lysozyme-treated bacteria may swell and rupture as a result of the entry of water into the cells, which have a high internal osmotic pressure. However, if the lysozyme-treated cells are in a solution with the same osmotic pressure as that of the bacterial interior, they will survive as spherical forms, called **protoplasts**, surrounded only by a cytoplasmic membrane.

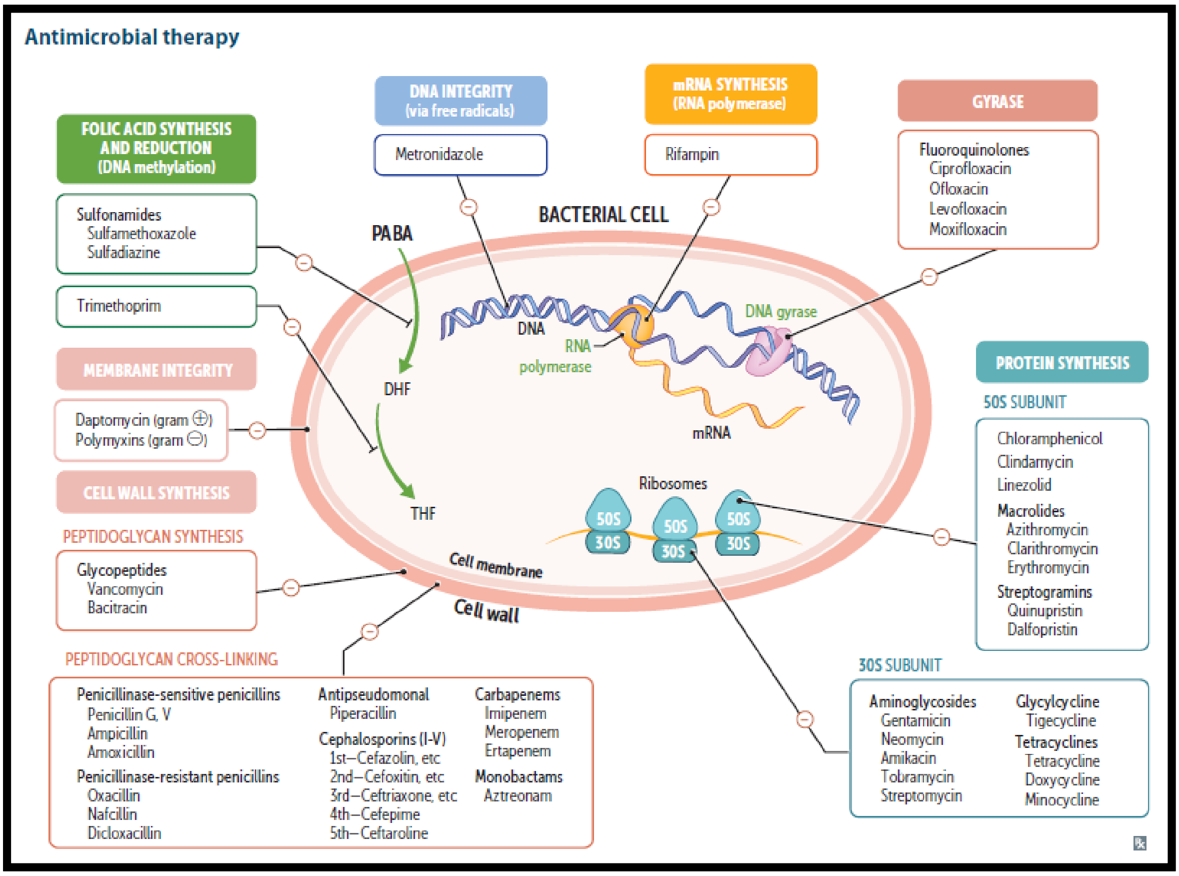
Lipopolysaccharide

The lipopolysaccharide (LPS) of the outer membrane of the cell

199. Quinolones act by inhibiting bacterial

a) synthesis of tetrahydrofolic acid
b) RNA polymerase
c) dihydrofolate reductase
d) DNA gyrase
e) synthesis of diaminopimellic acid

Key d


Antimicrobial therapy
FOLIC ACID SYNTHESIS AND REDUCTION (DNA methylation)
Sulfonamides
Sulfamethoxazole
Sulfadiazine
Trimethoprim
MEMBRANE INTEGRITY
Daptomycin (gram ⊕)
Polymyxins (gram ⊖)
CELL WALL SYNTHESIS
PEPTIDOGLYCAN SYNTHESIS
Glycopeptides
Vancomycin
Bacitracin
PEPTIDOGLYCAN CROSS-LINKING
Penicillinase-sensitive penicillins
Penicillin G, V
Ampicillin
Amoxicillin
Penicillinase-resistant penicillins
Oxacillin
Nafcillin
Dicloxacillin
Antipseudomonal
Piperacillin
Cephalosporins (I-V)
1st–Cefazolin, etc
2nd–Cefoxitin, etc
3rd–Ceftriaxone, etc
4th–Cefepime
5th–Ceftaroline
Carbapenems
Imipenem
Meropenem
Ertapenem
Monobactams
Aztreonam
DNA INTEGRITY (via free radicals)
Metronidazole
mRNA SYNTHESIS (RNA polymerase)
Rifampin
GYRASE
Fluoroquinolones
Ciprofloxacin
Ofloxacin
Levofloxacin
Moxifloxacin
BACTERIAL CELL
PABA
DHF
THF
DNA
RNA polymerase
DNA gyrase
mRNA
Ribosomes
50S
30S
Cell membrane
Cell wall
PROTEIN SYNTHESIS
50S SUBUNIT
Chloramphenicol
Clindamycin
Linezolid
Macrolides
Azithromycin
Clarithromycin
Erythromycin
Streptogramins
Quinupristin
Dalfopristin
30S SUBUNIT
Aminoglycosides
Gentamicin
Neomycin
Amikacin
Tobramycin
Streptomycin
Glycylcycline
Tigecycline
Tetracyclines
Tetracycline
Doxycycline
Minocycline

200. Skin can be cleansed before immunization or venipuncture with the use of

a) silver nitrate
b) formaldehyde
c) benzalkonium chloride
d) mercurochrome
e) 70% ethanol

Key e

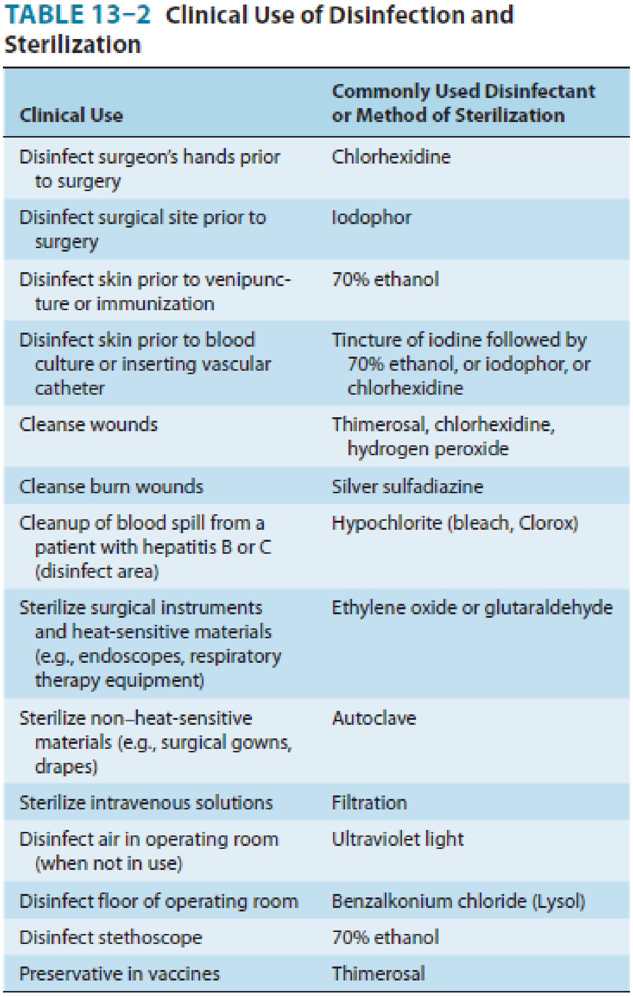


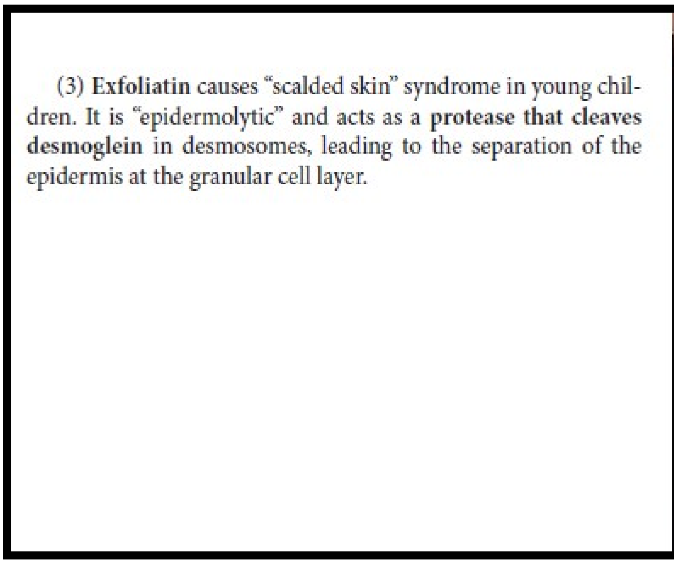
TABLE 13–2 Clinical Use of Disinfection and Sterilization

Clinical Use	Commonly Used Disinfectant or Method of Sterilization
Disinfect surgeon's hands prior to surgery	Chlorhexidine
Disinfect surgical site prior to surgery	Iodophor
Disinfect skin prior to venipuncture or immunization	70% ethanol
Disinfect skin prior to blood culture or inserting vascular catheter	Tincture of iodine followed by 70% ethanol, or iodophor, or chlorhexidine
Cleanse wounds	Thimerosal, chlorhexidine, hydrogen peroxide
Cleanse burn wounds	Silver sulfadiazine
Cleanup of blood spill from a patient with hepatitis B or C (disinfect area)	Hypochlorite (bleach, Clorox)
Sterilize surgical instruments and heat-sensitive materials (e.g., endoscopes, respiratory therapy equipment)	Ethylene oxide or glutaraldehyde
Sterilize non–heat-sensitive materials (e.g., surgical gowns, drapes)	Autoclave
Sterilize intravenous solutions	Filtration
Disinfect air in operating room (when not in use)	Ultraviolet light
Disinfect floor of operating room	Benzalkonium chloride (Lysol)
Disinfect stethoscope	70% ethanol
Preservative in vaccines	Thimerosal

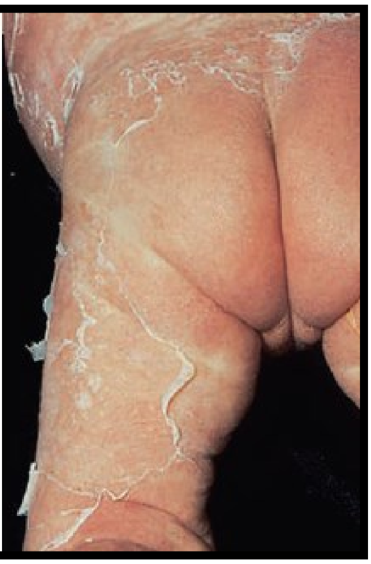
201. "Scalded skin syndrome" occurs because of the effects of

a) erythrogenic toxin
b) hyaluronidase
c) exfoliatin
d) pyogenic exotoxin A
e) P-V leucocidin

Key c



(3) **Exfoliatin** causes "scalded skin" syndrome in young children. It is "epidermolytic" and acts as a **protease that cleaves desmoglein** in desmosomes, leading to the separation of the epidermis at the granular cell layer.



202. The organs of motility in bacteria are called

a) pili
b) fimbriae
c) flagella
d) transposon
e) plasmids
Key c

203. Antibiotics that act by inhibiting the synthesis of bacterial cell wall and protein synthesis are most effective in the__________phase of the bacterial growth cycle

a) lag
b) log
c) stationary
d) statutory
e) death
Key b

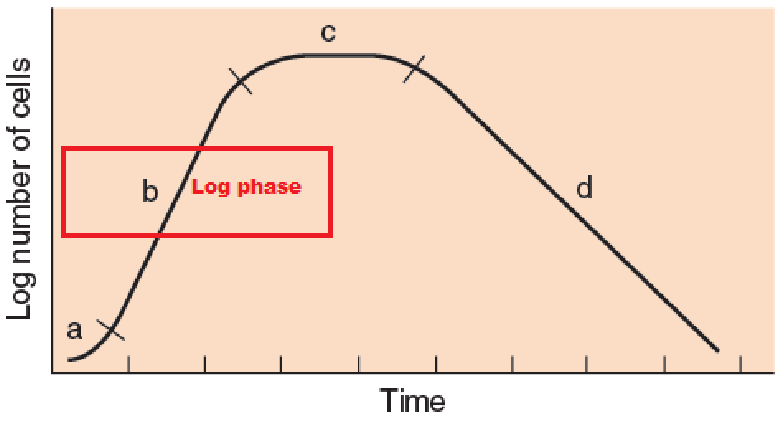


FIGURE 3–1 Growth curve of bacteria: a, lag phase; b, log phase; c, stationary phase; d, death phase.

204. The bacterial structure that provides extraordinary resistance to heat and chemicals is called

a) spore
b) teichoic acid
c) capsule
d) lipopolysaccharide
e) peptidoglycan
Key a

205. The bacterial structure that mediates the attachment of bacteria to specific receptors on the human cell surface are called

a) transposon
b) plasmid
c) pili
d) flagella
e) teichoic acid
Key c

206. Acid fastness of Mycobacteria is due to the prescence of ------------- in their cell wall.

a) wax D
b) ergosterol
c) peptidoglycan
d) lipoteichoic acid
e) mycolic acid
Key e

207. Treponema pallidum is a

a) gram positive rod
b) gram negative rod
c) spiral shaped organism
d) gram negative coccobacilli
e) gram positive diplococci

Key c

208. The most abundant member of the normal flora of the colon is

a) bacteroides fragilis
b) pseudomonas aeruginosa
c) enterococcus faecalis
d) enterobacter cloacae
e) enterococcus faecium

Key a

209. The process by which purified DNA is injected into the nucleus of a eukaryotic cell is called

a) transformation
b) conjugation
c) transduction
d) lysogenic conversion
e) transfection

Key e

Remember the following hints:

Agar bacteriophage ki baat ho = Transduction

Agar drug resistance transfer through sex pilus ki baat ho = Conjugation

Agar aesi baat ho keh doctor nay khud experiment keh chakkar main aik ka DNA doosray main daala = Transfection

Agar aesi story ho keh aik bacteria mar gya aur uska DNA kisi aur bacteria nay uptake kerlia = Transformation

210. Water in community swimming pools can be purified with the use of

a) iodine
b) mercury
c) silver
d) chlorine
e) hydrogen peroxide

Key d

211. Staphylococci can be differentiated from streptococci on the basis of

a) catalase
b) oxidase
c) coagulase
d) urease
e) DNAse

Key a

212. Meningococcal vaccine contains the capsular polysaccharides of all the following groups of Neisseria meningitides as immunogens EXCEPT

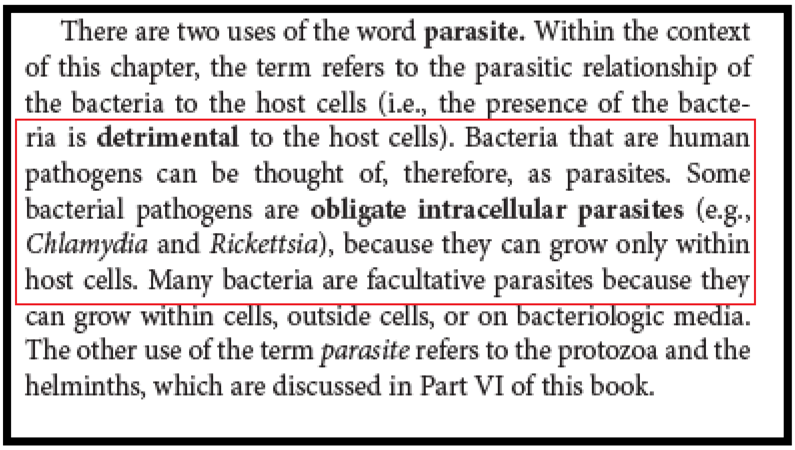
a) A
b) B
c) C
d) Y
e) W-135

Key b

213. An example of obligate intracellular parasite is

a) leptospira
b) bordetella
c) rickettsia
d) legionella
e) nocardia

Key c



There are two uses of the word **parasite.** Within the context of this chapter, the term refers to the parasitic relationship of the bacteria to the host cells (i.e., the presence of the bacteria is **detrimental** to the host cells). Bacteria that are human pathogens can be thought of, therefore, as parasites. Some bacterial pathogens are **obligate intracellular parasites** (e.g., *Chlamydia* and *Rickettsia*), because they can grow only within host cells. Many bacteria are facultative parasites because they can grow within cells, outside cells, or on bacteriologic media. The other use of the term *parasite* refers to the protozoa and the helminths, which are discussed in Part VI of this book.

214. An example of an anaerobic gram-positive rod is

a) clostridium botulinum
b) nocardia asteroides
c) pseudomonas aeruginosa
d) bacillus anthracis
e) bacteroides fragilis

Key a

215. A 60-year-old man had dental implant surgery performed. A week later he presented to the emergency with complaints of high-grade fever, palpitations, tachycardia and shortness of breath. Murmurs were heard on chest auscultation. He was diagnosed with infective endocarditis. The most probable organism responsible for his condition is

a) Staphylococcus aureus
b) streptococcus pyogenes
c) enterococcus faecium
d) streptococcus viridans
e) staphylococcus epidermidis

Key d

216. Slime bacterial structure called

a) fimbriae
b) pili
c) capsule
d) flagella
e) glycocalyx

Key e

217. Which element is utilized by the siderophores produced by E. coli to aid in their growth?

a) copper
b) potassium
c) zinc
d) iron
e) magnesium

Key d

Explanation:

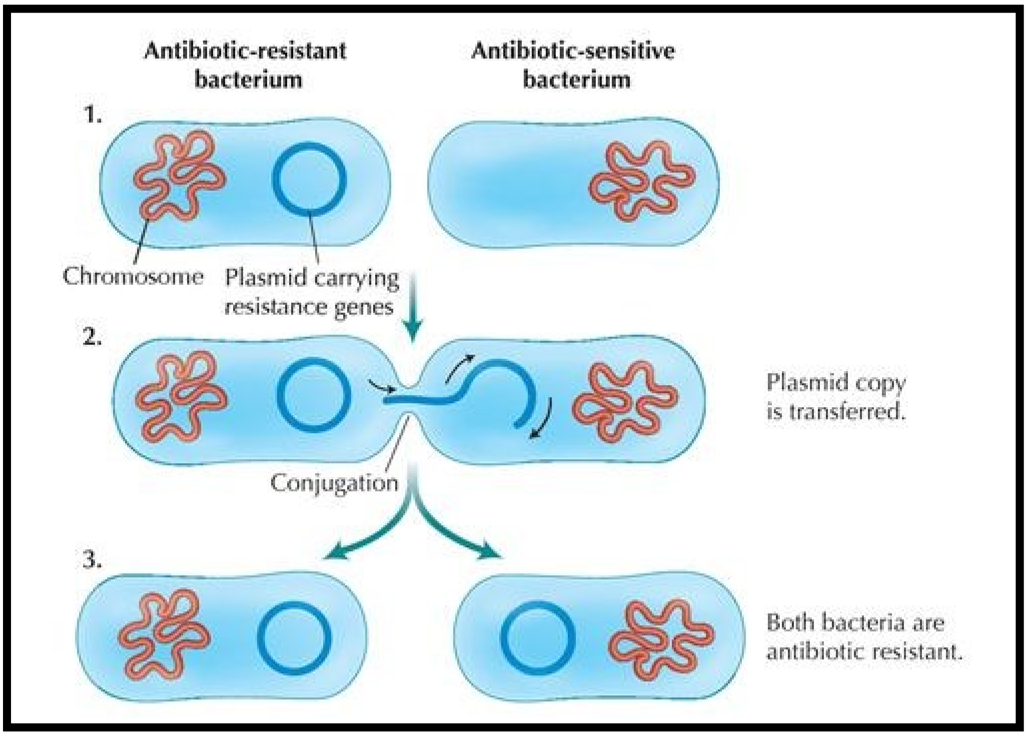
- **Siderophores are specialized molecules produced by bacteria, including *Escherichia coli*, to scavenge iron from the environment.**

- **Iron is an essential nutrient for bacterial growth but is often limited in availability due to its poor solubility in water and its sequestration by host proteins (e.g., transferrin, lactoferrin) in humans.**

- **Siderophores, like enterobactin in *E. coli*, bind iron (Fe^{3+}) with high affinity and transport it back into the bacterial cell, enabling the bacterium to thrive in iron-limited environments such as the host body.**

218. Antibiotic resistance can be mediated by the action of

a) fimbriae
b) glycocalyx
c) plasmid
d) pili
e) ribosomes
Key c


Antibiotic-resistant bacterium
Antibiotic-sensitive bacterium
1.
Chromosome
Plasmid carrying resistance genes
2.
Plasmid copy is transferred.
Conjugation
3.
Both bacteria are antibiotic resistant.

219. An example of capsular polysaccharide vaccine is

a) DPT
b) BCG
c) Pneumococcal vaccine
d) cholera vaccine
e) Yersinia vaccine
Key c

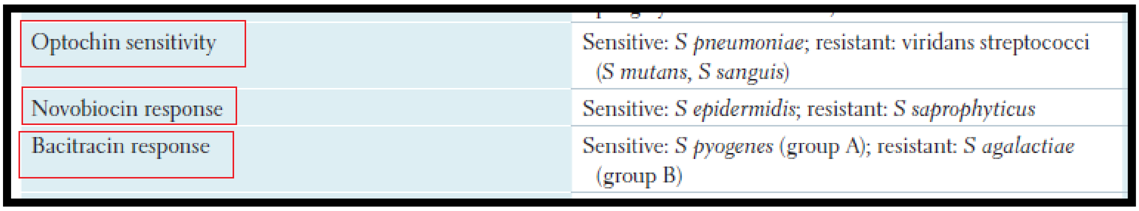
220. Glutaraldehyde is used to sterilize

a) sutures
b) syringes
c) surgical gloves
d) respiratory therapy equipment
e) glassware
Key d

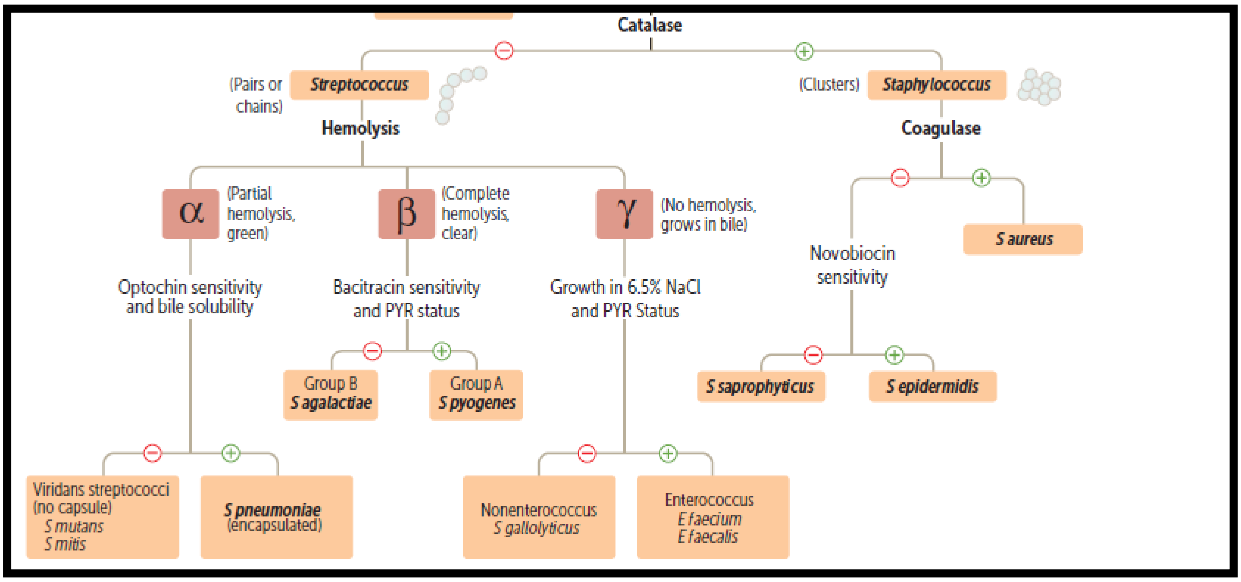
221. Sputum culture of a 20 year old man having high grade fever, rigors & chills, shortness of breath and productive cough yielded alpha hemolytic colonies on blood agar . gram stain revealed gram positive diplococcic. Organism was bile soluble and sensitive to optochin. the most probable organism is

a) streptococcus pyogenes
b) streptococcus viridans
c) enterococcus faecalis
d) enterococcus faecium
e) streptococcus pneumoniae

Key e



Optochin sensitivity	Sensitive: *S pneumoniae*; resistant: viridans streptococci (*S mutans*, *S sanguis*)
Novobiocin response	Sensitive: *S epidermidis*; resistant: *S saprophyticus*
Bacitracin response	Sensitive: *S pyogenes* (group A); resistant: *S agalactiae* (group B)


Catalase
(Pairs or chains)
Streptococcus
Hemolysis
(Clusters)
Staphylococcus
Coagulase
α
(Partial hemolysis, green)
β
(Complete hemolysis, clear)
γ
(No hemolysis, grows in bile)
S aureus
Novobiocin sensitivity
Optochin sensitivity and bile solubility
Bacitracin sensitivity and PYR status
Growth in 6.5% NaCl and PYR Status
Group B S agalactiae
Group A S pyogenes
S saprophyticus
S epidermidis
Viridans streptococci (no capsule) S mutans S mitis
S pneumoniae (encapsulated)
Nonenterococcus S gallolyticus
Enterococcus E faecium E faecalis

222. Candida Albicans is the part of the normal flora of

a) throat, nose, colon
b) mouth, nose, vagina
c) throat,colon, vagina
d) mouth, colon, vagina
e) throat,mouth, colon

Key b CORRECTED = D

223. The predominant and most significant colonizer of the nose is

a) streptococcus pneumoniae
b) staphylococcus aureus
c) streptococcus agalactiae
d) staphylococcus saprophyticus
e) streptococcus pyogenes

Key b

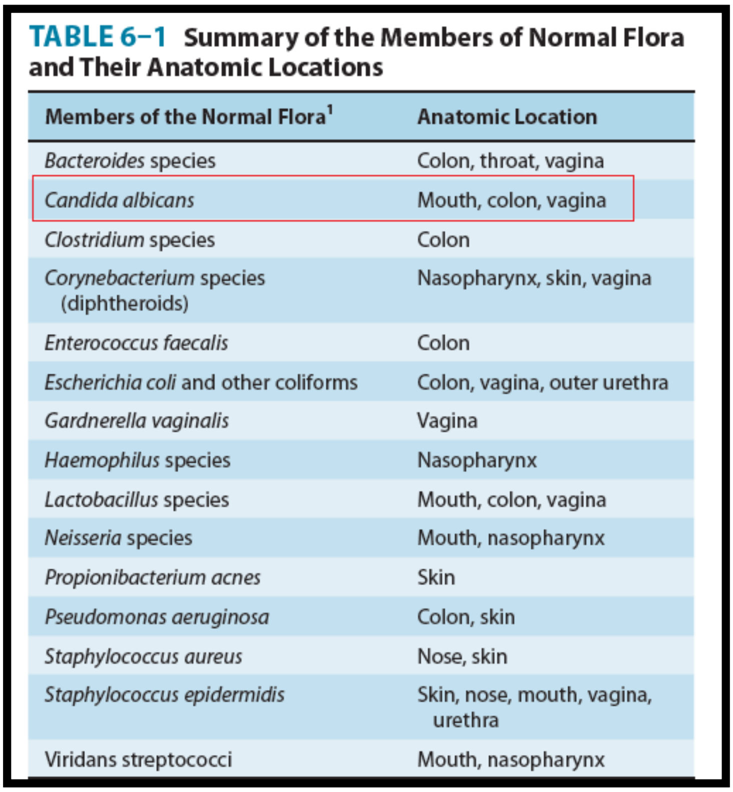


TABLE 6–1 Summary of the Members of Normal Flora and Their Anatomic Locations

Members of the Normal Flora[1]	Anatomic Location
Bacteroides species	Colon, throat, vagina
Candida albicans	Mouth, colon, vagina
Clostridium species	Colon
Corynebacterium species (diphtheroids)	Nasopharynx, skin, vagina
Enterococcus faecalis	Colon
Escherichia coli and other coliforms	Colon, vagina, outer urethra
Gardnerella vaginalis	Vagina
Haemophilus species	Nasopharynx
Lactobacillus species	Mouth, colon, vagina
Neisseria species	Mouth, nasopharynx
Propionibacterium acnes	Skin
Pseudomonas aeruginosa	Colon, skin
Staphylococcus aureus	Nose, skin
Staphylococcus epidermidis	Skin, nose, mouth, vagina, urethra
Viridans streptococci	Mouth, nasopharynx

224. The antibiotic that acts by inhibition of 23S ribosomal RNA in the 50 S subunit is

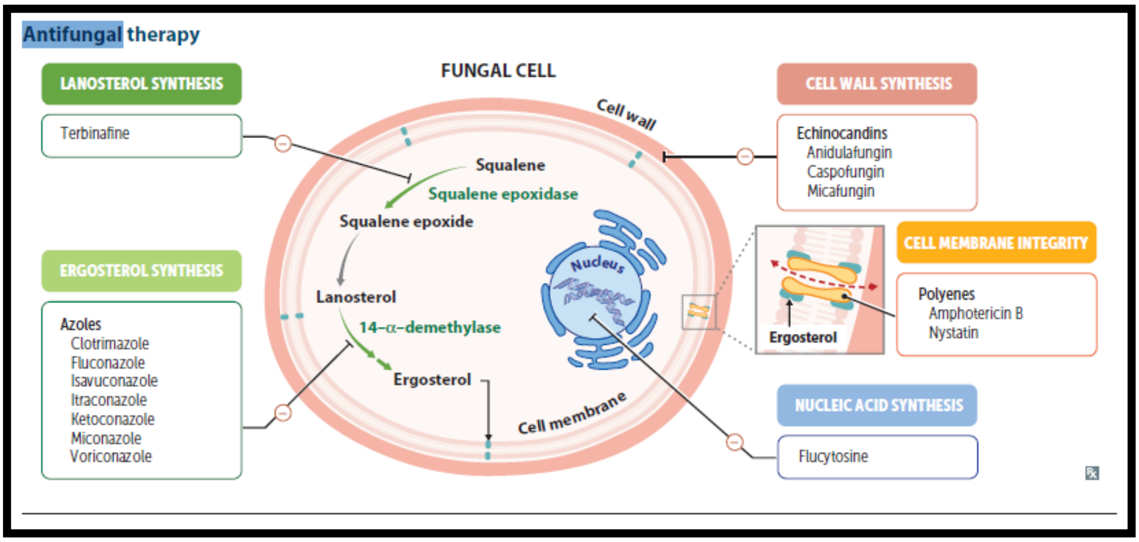
a) linezolid
b) vancomycin
c) tetracyclin
d) clindamycin
e) chloramphenicol
Key a

225. Acute rheumatic fever is caused by

a) staphylococcus aureus
b) streptococcus pyogenes
c) staphylococcus epidermidis
d) streptococcus pneumoniae
e) streptococcus agalactiae
Key b

226. The drug that acts by inhibiting the ergosterol synthesis is

a) griseofulvin
b) isoniazid
c) Ethambutol
d) metronidazole
e) ketoconazole
Key e


Antifungal therapy
LANOSTEROL SYNTHESIS
Terbinafine
ERGOSTEROL SYNTHESIS
Azoles
Clotrimazole
Fluconazole
Isavuconazole
Itraconazole
Ketoconazole
Miconazole
Voriconazole
FUNGAL CELL
Cell wall
Squalene
Squalene epoxidase
Squalene epoxide
Lanosterol
14-α-demethylase
Ergosterol
Nucleus
Cell membrane
CELL WALL SYNTHESIS
Echinocandins
Anidulafungin
Caspofungin
Micafungin
Ergosterol
CELL MEMBRANE INTEGRITY
Polyenes
Amphotericin B
Nystatin
NUCLEIC ACID SYNTHESIS
Flucytosine

227. An example of Toxoid vaccine is the vaccine used against

a) rickettsia
b) vibrio cholerae
c) salmonella typhi
d) corynebacterium diphtheriae
e) mycobacterium tuberculosis
Key d

228. BCG vaccine is a__________vaccine

a) purified protein
b) capsular polysaccharide
c) live attenuated bacterial
d) killed bacterial
e) toxoid
Key c

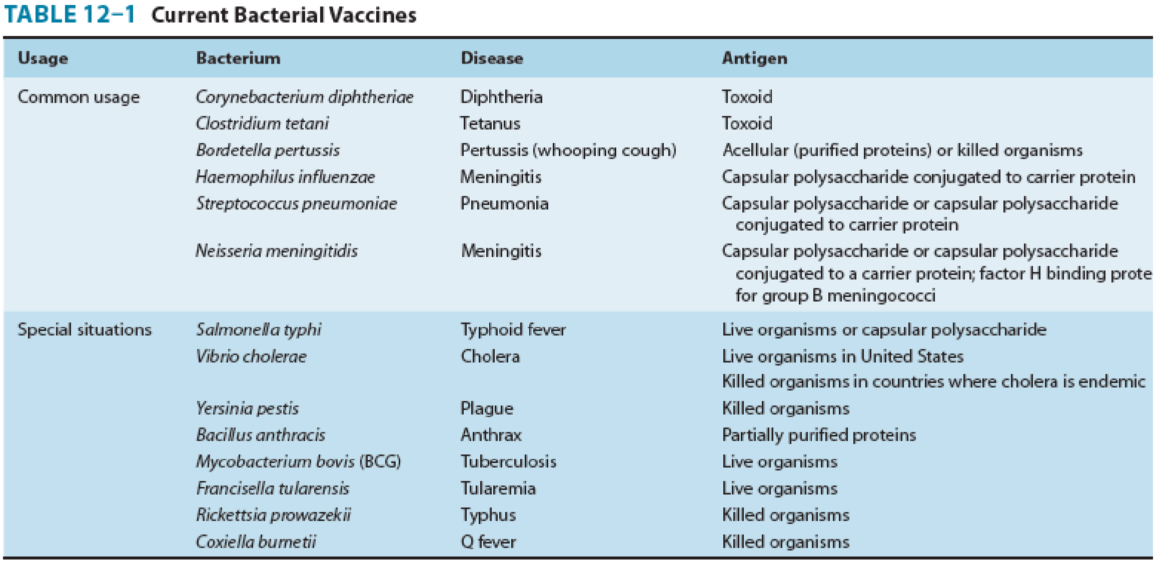


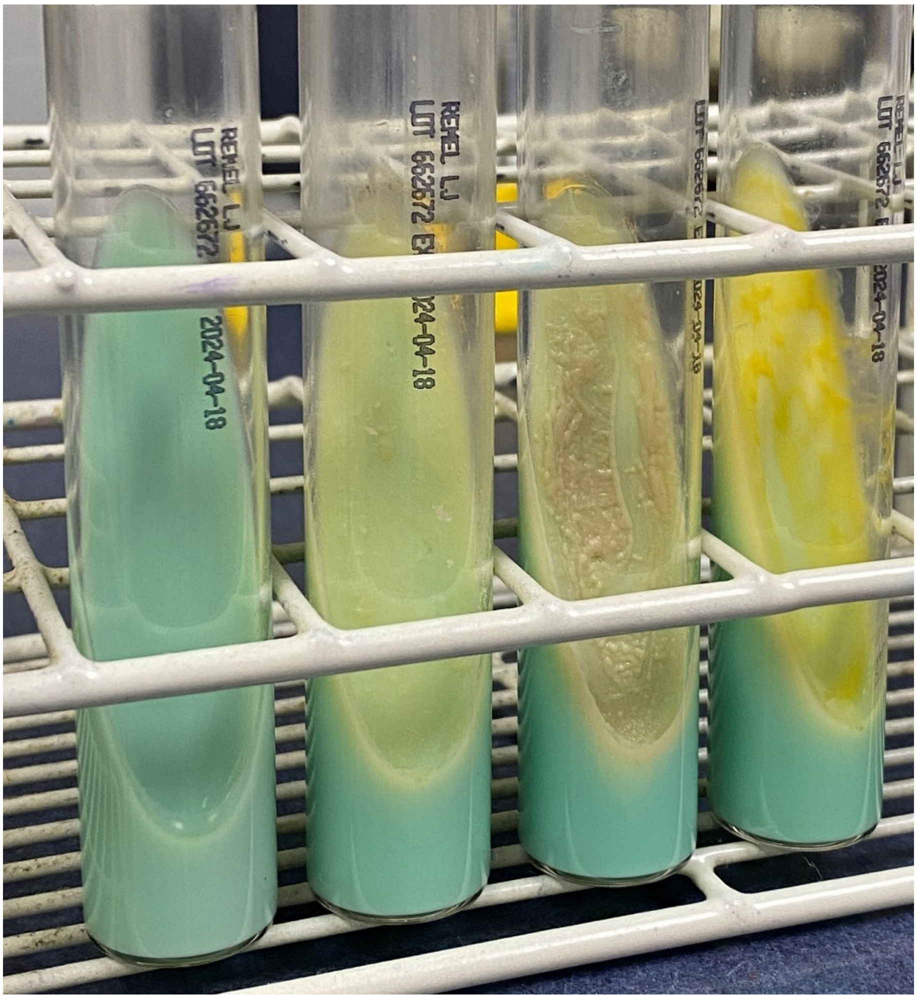
TABLE 12–1 Current Bacterial Vaccines

Usage	Bacterium	Disease	Antigen
Common usage	*Corynebacterium diphtheriae*	Diphtheria	Toxoid
	Clostridium tetani	Tetanus	Toxoid
	Bordetella pertussis	Pertussis (whooping cough)	Acellular (purified proteins) or killed organisms
	Haemophilus influenzae	Meningitis	Capsular polysaccharide conjugated to carrier protein
	Streptococcus pneumoniae	Pneumonia	Capsular polysaccharide or capsular polysaccharide conjugated to carrier protein
	Neisseria meningitidis	Meningitis	Capsular polysaccharide or capsular polysaccharide conjugated to a carrier protein; factor H binding prote for group B meningococci
Special situations	*Salmonella typhi*	Typhoid fever	Live organisms or capsular polysaccharide
	Vibrio cholerae	Cholera	Live organisms in United States
			Killed organisms in countries where cholera is endemic
	Yersinia pestis	Plague	Killed organisms
	Bacillus anthracis	Anthrax	Partially purified proteins
	Mycobacterium bovis (BCG)	Tuberculosis	Live organisms
	Francisella tularensis	Tularemia	Live organisms
	Rickettsia prowazekii	Typhus	Killed organisms
	Coxiella burnetii	Q fever	Killed organisms

229. The dye present in Lowenstein-jensen medium that inhibits the growth of unwanted organisms is

a) methylene blue
b) Prussian blue
c) malachite green
d) bromocresol purple
e) gentian violet

Key c



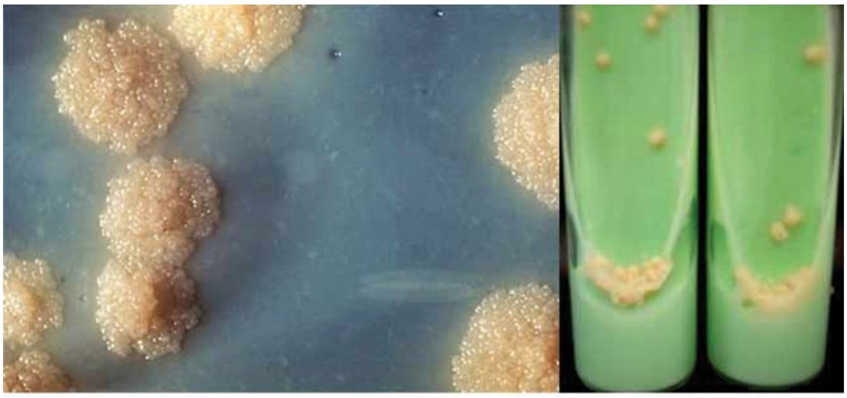


Fig: Cultural Characteristics of *Mycobacterium tuberculosis*

Also know:

Which of the following best describes the role of glycerol in Lowenstein-Jensen (LJ) medium?

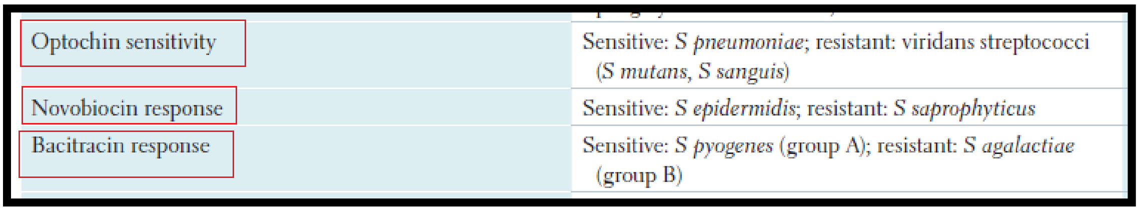
A. Inhibits the growth of non-tuberculous mycobacteria
B. Enhances growth of Mycobacterium tuberculosis as a carbon source
C. Acts as a solidifying agent for the medium
D. Provides a nitrogen source for bacterial growth

Correct Answer: B. Enhances growth of Mycobacterium tuberculosis as a carbon source

230. Gram stain of an isolate from urine culture reveals gram positive cocci in clusters. The isolate is declared to be Staphylococcus saprophyticus. Resistance to which diagnostic drug disc helped the microbiologist reaches this decision?

a) cefoxitin
b) oxacillin
c) novobiocin
d) optochin
e) bacitracin

Key c



Optochin sensitivity	Sensitive: *S pneumoniae*; resistant: viridans streptococci (*S mutans*, *S sanguis*)
Novobiocin response	Sensitive: *S epidermidis*; resistant: *S saprophyticus*
Bacitracin response	Sensitive: *S pyogenes* (group A); resistant: *S agalactiae* (group B)

231. The agent used to disinfect contact lenses and also as an antiseptic to clean wounds is

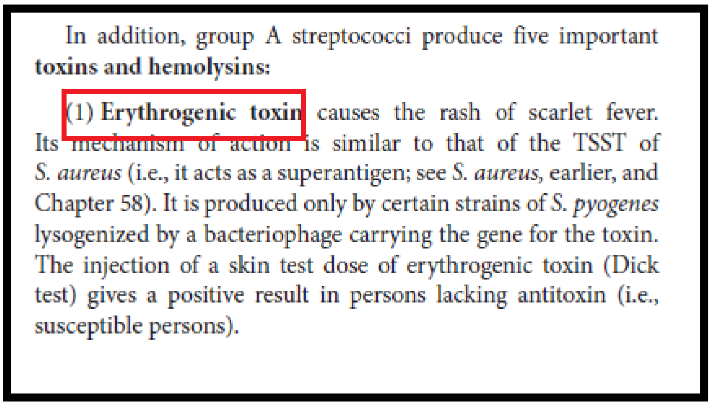
a) hydrogen peroxide
b) ethanol
c) iodine
d) phenol
e) silver nitrate

Key a

232. Scarlett fever is caused by

a) exfoliatin
b) PV leukocidin
c) hemolysin S
d) hemolysin O
e) erythrogenic toxin

Key e



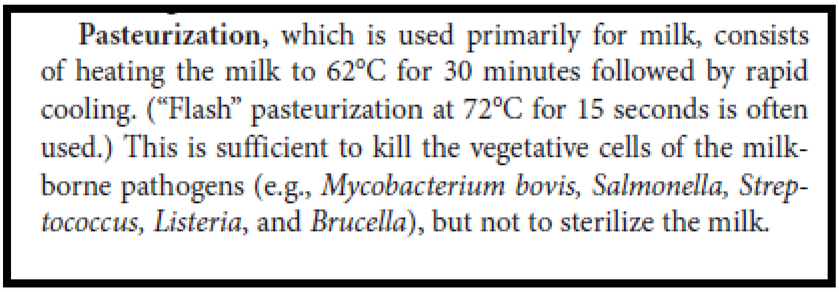
In addition, group A streptococci produce five important **toxins and hemolysins:**

(1) Erythrogenic toxin causes the rash of scarlet fever. Its mechanism of action is similar to that of the TSST of *S. aureus* (i.e., it acts as a superantigen; see *S. aureus*, earlier, and Chapter 58). It is produced only by certain strains of *S. pyogenes* lysogenized by a bacteriophage carrying the gene for the toxin. The injection of a skin test dose of erythrogenic toxin (Dick test) gives a positive result in persons lacking antitoxin (i.e., susceptible persons).

233. The process by which milk is heated to 62ºC for 30 minutes followed by rapid cooling in order to kill the vegetative cells of milk-borne pathogens is called

a) Autoclaving
b) boiling
c) incineration
d) pasteurization
e) tyndallization

Key d

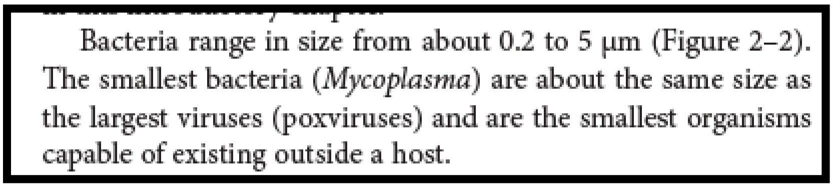


Pasteurization, which is used primarily for milk, consists of heating the milk to 62°C for 30 minutes followed by rapid cooling. ("Flash" pasteurization at 72°C for 15 seconds is often used.) This is sufficient to kill the vegetative cells of the milk-borne pathogens (e.g., *Mycobacterium bovis, Salmonella, Streptococcus, Listeria*, and *Brucella*), but not to sterilize the milk.

234. The smallest pathogenic bacteria known to mankind are

a) Borrelia
b) Mycoplasma
c) Rickettsia
d) Mycobacteria

Key b



Bacteria range in size from about 0.2 to 5 μm (Figure 2–2). The smallest bacteria (*Mycoplasma*) are about the same size as the largest viruses (poxviruses) and are the smallest organisms capable of existing outside a host.

235. Beta lactamases that are formed by some gram-negative bacteria are found in

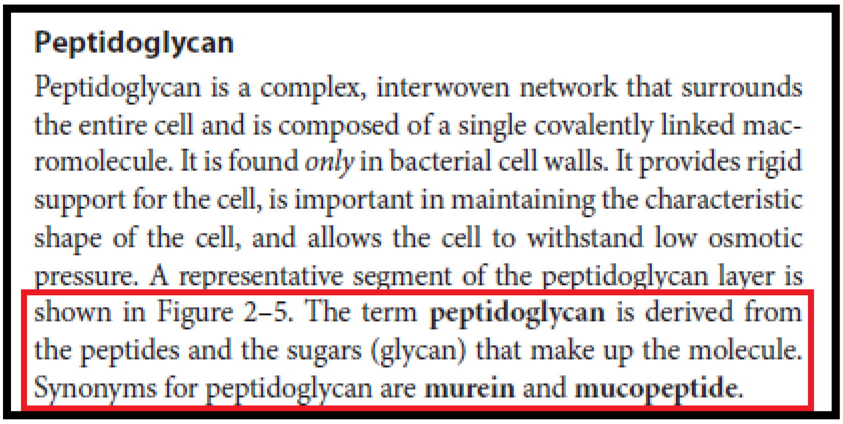
a) periplasmic space
b) cytoplasmic membrane
c) glycocalyx
d) capsule

Key a

236. Murein is another name for

a) teichoic acid
b) lipopolysaccharide
c) peptidoglycan
d) glycocalyx

Key c



Peptidoglycan

Peptidoglycan is a complex, interwoven network that surrounds the entire cell and is composed of a single covalently linked macromolecule. It is found *only* in bacterial cell walls. It provides rigid support for the cell, is important in maintaining the characteristic shape of the cell, and allows the cell to withstand low osmotic pressure. A representative segment of the peptidoglycan layer is shown in Figure 2–5. The term **peptidoglycan** is derived from the peptides and the sugars (glycan) that make up the molecule. Synonyms for peptidoglycan are **murein** and **mucopeptide**.

237. Bacteria reproduce by
a) binary fission
b) sporogony
c) budding
d) mitosis
Key a

238. Bacterial exotoxins are encoded by bacteriophage genes and are transferred by
a) transduction
b) transformation
c) conjugation
d) transfection
Key a

Remember the following hints:

Agar bacteriophage ki baat ho = Transduction

Agar drug resistance transfer through sex pilus ki baat ho = Conjugation

Agar aesi baat ho keh doctor nay khud experiment keh chakkar main aik ka DNA doosray main daala = Transfection

Agar aesi story ho keh aik bacteria mar gya aur uska DNA kisi aur bacteria nay uptake kerlia = Transformation

239. The rapid cell division of bacteria occurs during the ....phase.
a) lag
b) log
c) stationary
d) death
Key b

240. Antibiotic resistance genes are spread from one bacterium to another primarily by
a) transduction
b) conjugation
c) transformation
d) transfection
Key b

241. When a bacterial virus is involved in the transfer of cell DNA, the process is called
a) transfection
b) conjugation
c) transduction
d) transformation
Key c

242. Necrotizing Facsitis/ Gas gangrene is caused by

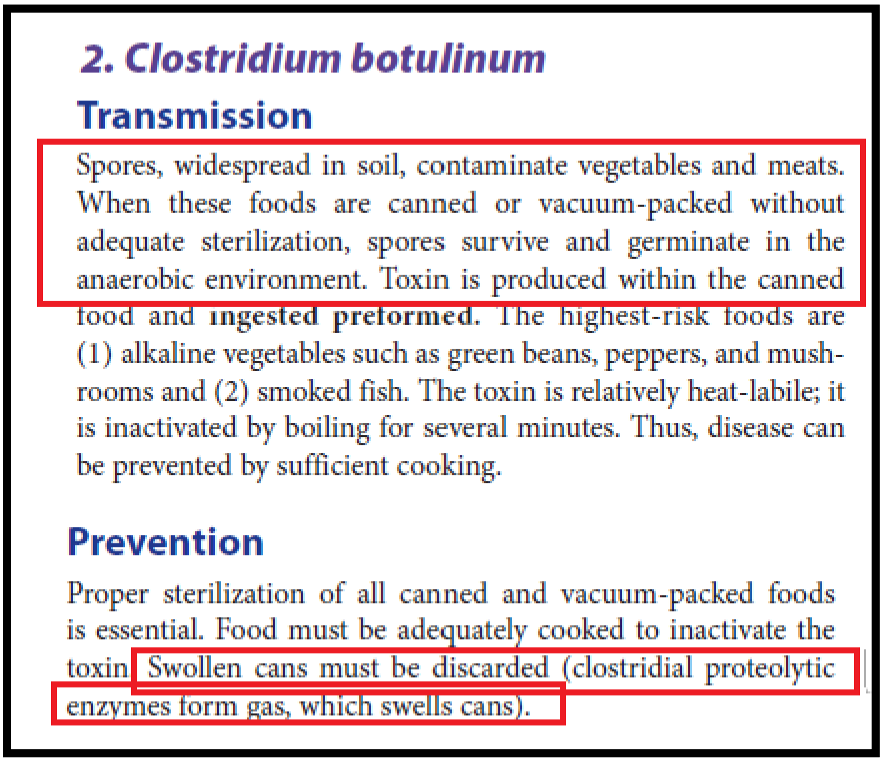
a) staphylococcus aureus
b) clostridium perfringens
c) vibrio vulmificus
d) prevotella melaninogenica

Key b

243. Ingestion of food from swollen cans can result in infection from

a) Staphylococcus enterotoxin
b) bacillus cereus
c) clostridium botulinum
d) listeria monocytogenes

Key c



2. Clostridium botulinum

Transmission

Spores, widespread in soil, contaminate vegetables and meats. When these foods are canned or vacuum-packed without adequate sterilization, spores survive and germinate in the anaerobic environment. Toxin is produced within the canned food and **ingested preformed.** The highest-risk foods are (1) alkaline vegetables such as green beans, peppers, and mushrooms and (2) smoked fish. The toxin is relatively heat-labile; it is inactivated by boiling for several minutes. Thus, disease can be prevented by sufficient cooking.

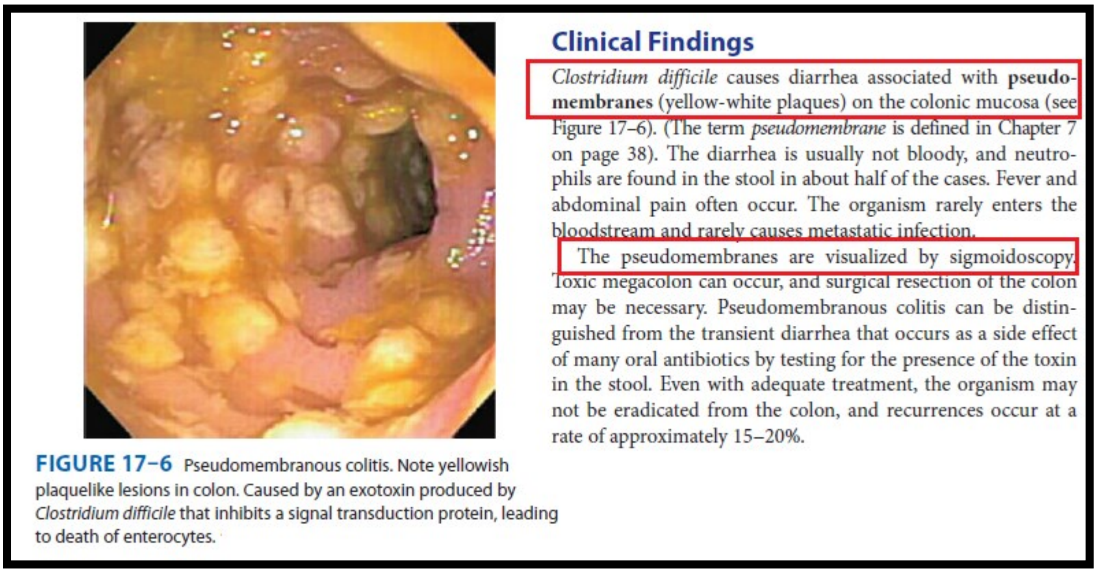
Prevention

Proper sterilization of all canned and vacuum-packed foods is essential. Food must be adequately cooked to inactivate the toxin Swollen cans must be discarded (clostridial proteolytic enzymes form gas, which swells cans).

244. Pseudo-membranous colitis is caused by

a) corynebacterium diphtheriae
b) clostridium difficile
c) enterococcus faecalis
d) bacillus cereus

Key b



Clinical Findings

Clostridium difficile causes diarrhea associated with **pseudomembranes** (yellow-white plaques) on the colonic mucosa (see Figure 17–6). (The term *pseudomembrane* is defined in Chapter 7 on page 38). The diarrhea is usually not bloody, and neutrophils are found in the stool in about half of the cases. Fever and abdominal pain often occur. The organism rarely enters the bloodstream and rarely causes metastatic infection.

The pseudomembranes are visualized by sigmoidoscopy. Toxic megacolon can occur, and surgical resection of the colon may be necessary. Pseudomembranous colitis can be distinguished from the transient diarrhea that occurs as a side effect of many oral antibiotics by testing for the presence of the toxin in the stool. Even with adequate treatment, the organism may not be eradicated from the colon, and recurrences occur at a rate of approximately 15–20%.

FIGURE 17–6 Pseudomembranous colitis. Note yellowish plaquelike lesions in colon. Caused by an exotoxin produced by *Clostridium difficile* that inhibits a signal transduction protein, leading to death of enterocytes.

245. The predominant member of the normal flora of the skin is

a) staphylococcus aureus
b) streptococcus pyogenes
c) staphylococcus epidermidis
d) streptococcus viridans

Key a ANSWER = CORRECTED C

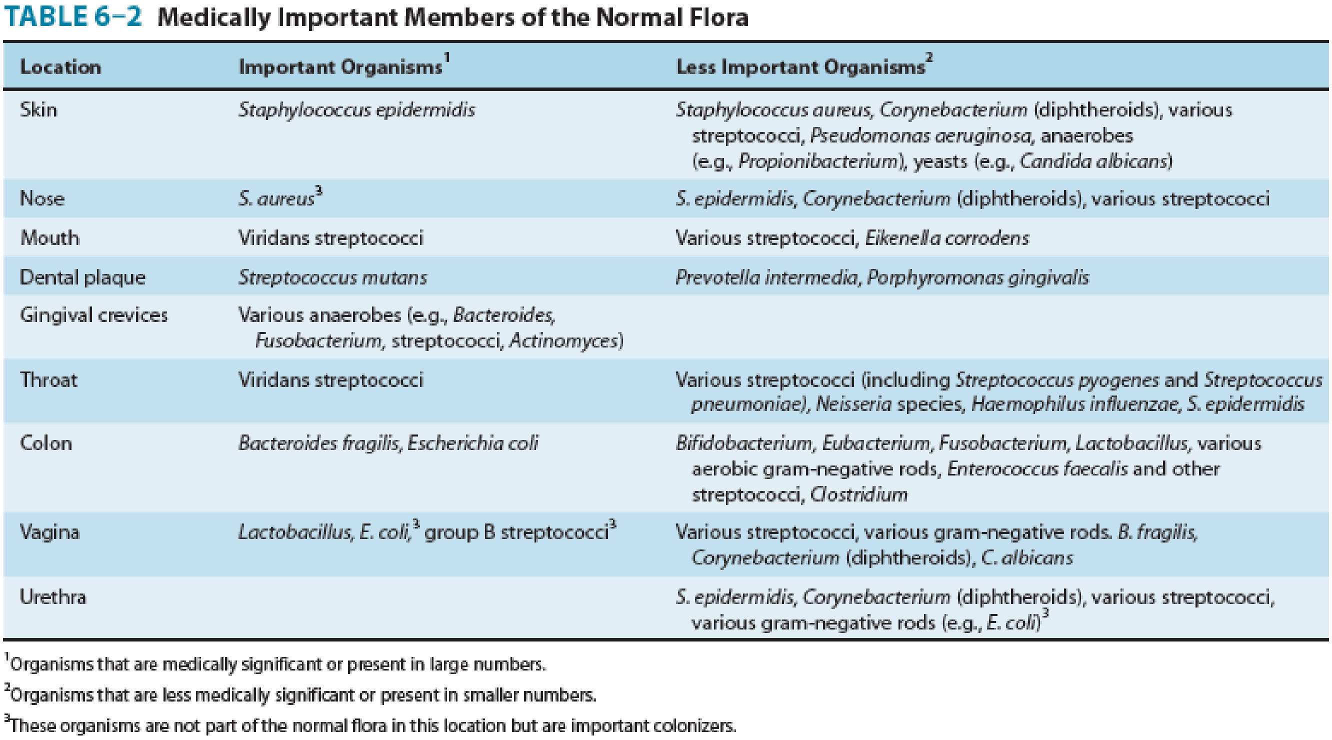


TABLE 6–2 Medically Important Members of the Normal Flora

Location	Important Organisms[1]	Less Important Organisms[2]
Skin	*Staphylococcus epidermidis*	*Staphylococcus aureus*, *Corynebacterium* (diphtheroids), various streptococci, *Pseudomonas aeruginosa*, anaerobes (e.g., *Propionibacterium*), yeasts (e.g., *Candida albicans*)
Nose	*S. aureus*[3]	*S. epidermidis*, *Corynebacterium* (diphtheroids), various streptococci
Mouth	Viridans streptococci	Various streptococci, *Eikenella corrodens*
Dental plaque	*Streptococcus mutans*	*Prevotella intermedia*, *Porphyromonas gingivalis*
Gingival crevices	Various anaerobes (e.g., *Bacteroides*, *Fusobacterium*, streptococci, *Actinomyces*)	
Throat	Viridans streptococci	Various streptococci (including *Streptococcus pyogenes* and *Streptococcus pneumoniae*), *Neisseria* species, *Haemophilus influenzae*, *S. epidermidis*
Colon	*Bacteroides fragilis*, *Escherichia coli*	*Bifidobacterium*, *Eubacterium*, *Fusobacterium*, *Lactobacillus*, various aerobic gram-negative rods, *Enterococcus faecalis* and other streptococci, *Clostridium*
Vagina	*Lactobacillus*, *E. coli*,[3] group B streptococci[3]	Various streptococci, various gram-negative rods. *B. fragilis*, *Corynebacterium* (diphtheroids), *C. albicans*
Urethra		*S. epidermidis*, *Corynebacterium* (diphtheroids), various streptococci, various gram-negative rods (e.g., *E. coli*)[3]

[1] Organisms that are medically significant or present in large numbers.

[2] Organisms that are less medically significant or present in smaller numbers.

[3] These organisms are not part of the normal flora in this location but are important colonizers.

246. Dental plaque in the teeth is formed chiefly due to the prescence of streptococcus

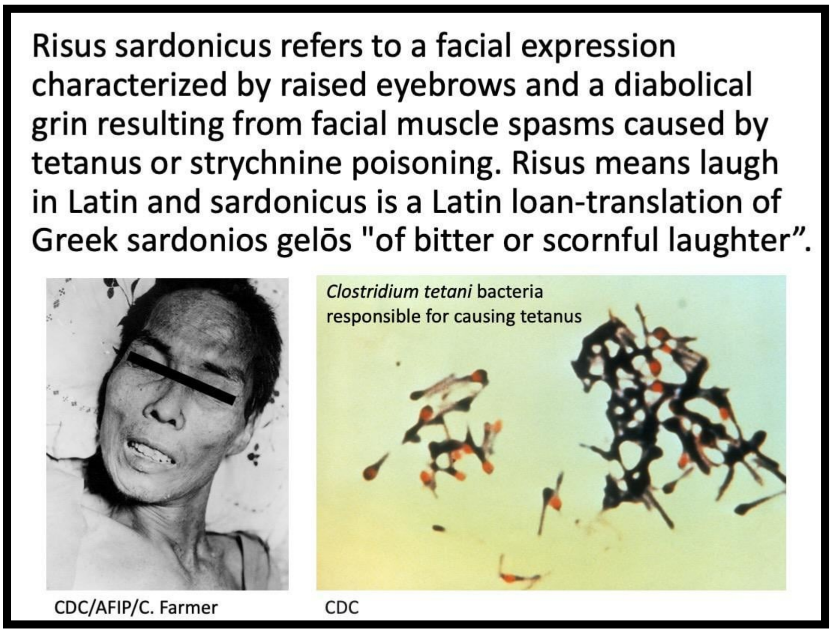
a) mitis
b) mutans
c) intermedius
d) milleri

Key b

247. ‘Risus Sardonicus’ is a characteristic feature of infection with clostridium

a) difficile
b) botulinum

c) perfringens
d) tetani
Key d



Risus sardonicus refers to a facial expression characterized by raised eyebrows and a diabolical grin resulting from facial muscle spasms caused by tetanus or strychnine poisoning. Risus means laugh in Latin and sardonicus is a Latin loan-translation of Greek sardonios gelōs "of bitter or scornful laughter".

Clostridium tetani bacteria responsible for causing tetanus

CDC/AFIP/C. Farmer

CDC

248. In order to obtain a sample for blood culture of an adult, the right amount of sample drawn is

a) 5 ml
b) 7ml
c) 10 ml
d) 15ml
Key c

249. Throat swabs are used primarily to detect the prescence of

a) streptococcus pyogenes
b) staphylococcus aureus
c) staphylococcus epidermidis
d) streptococcus viridans
Key a

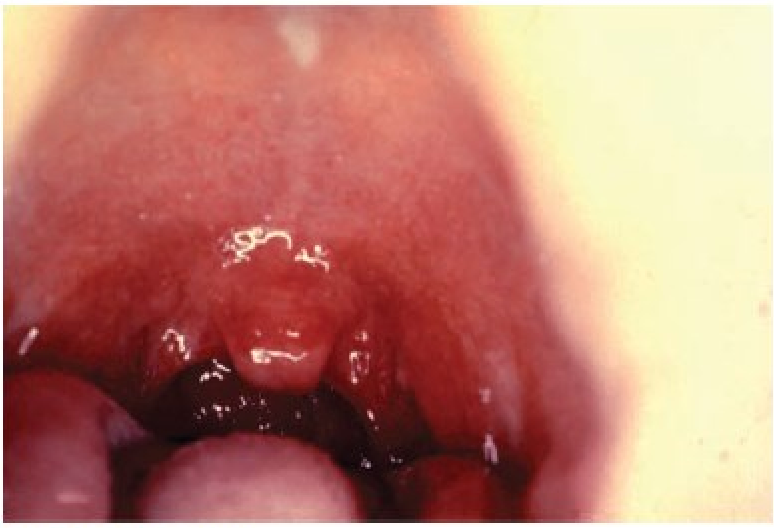
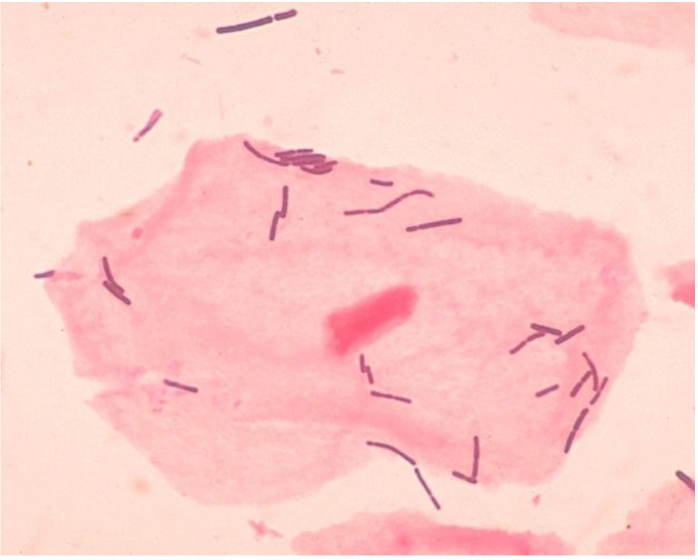


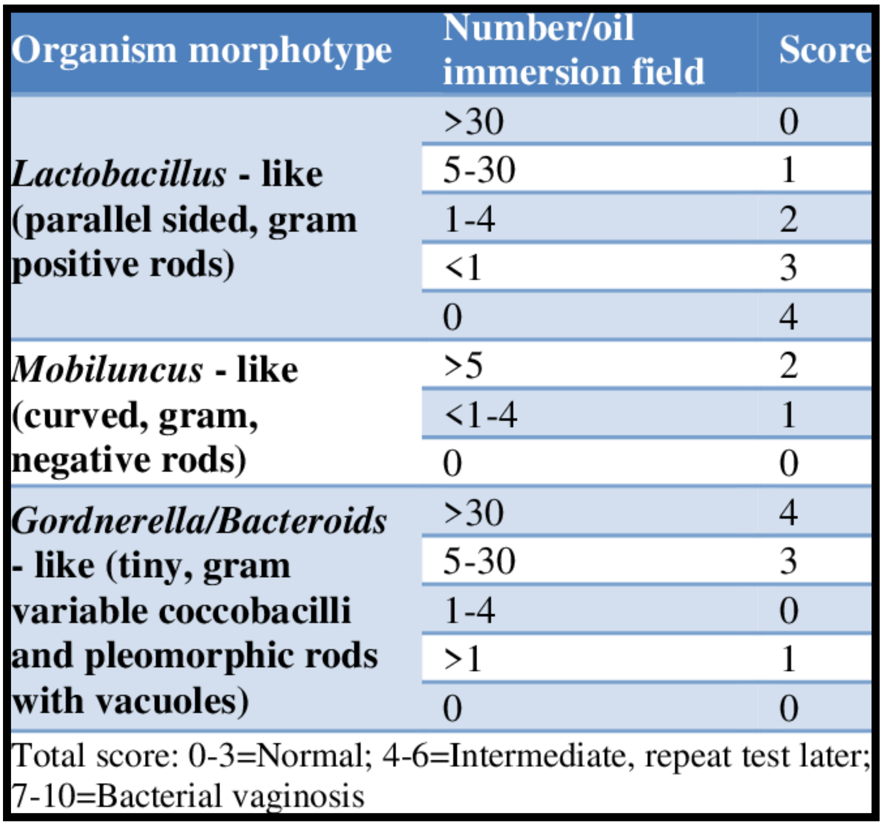
FIGURE 15–8 Pharyngitis. Note erythema of soft palate, uvula, and posterior pharynx and swelling of the uvula. The most common bacterial cause of pharyngitis is *Streptococcus pyogenes*.

250. The member of normal flora responsible for keeping the PH of vagina low & thereby preventing the growth of potential pathogens is

a) gardenerella vaginalis
b) candida albicans
c) streptococcus agalactiae
d) lactobacillus
Key d



Also know concept of Nugent Scoring for Dx of bacterial vaginosis given below:



Organism morphotype	Number/oil immersion field	Score
Lactobacillus - like (parallel sided, gram positive rods)	>30	0
	5-30	1
	1-4	2
	<1	3
	0	4
Mobiluncus - like (curved, gram, negative rods)	>5	2
	<1-4	1
	0	0
Gordnerella/Bacteroids - like (tiny, gram variable coccobacilli and pleomorphic rods with vacuoles)	>30	4
	5-30	3
	1-4	0
	>1	1
	0	0
Total score: 0-3=Normal; 4-6=Intermediate, repeat test later; 7-10=Bacterial vaginosis		

251. The best sample for culture when suspecting pulmonary tuberculosis is

a) Nasal swab
b) throat swab
c) sputum
d) pus
Key c

252. The most frequently isolated organism from urine culture samples is

a) klebsiella pneumoniae
b) Escherichia coli
c) serratia marscecens
d) Staphylococcus saprophyticus
Key b

253. Penicillins act by inhibiting

a) protein synthesis by acting on 30 S subunit
b) DNA synthesis by blocking DNA gyrase
c) protein synthesis by acting on 50 S subunit
d) cell wall synthesis by blocking transpeptidases
Key d

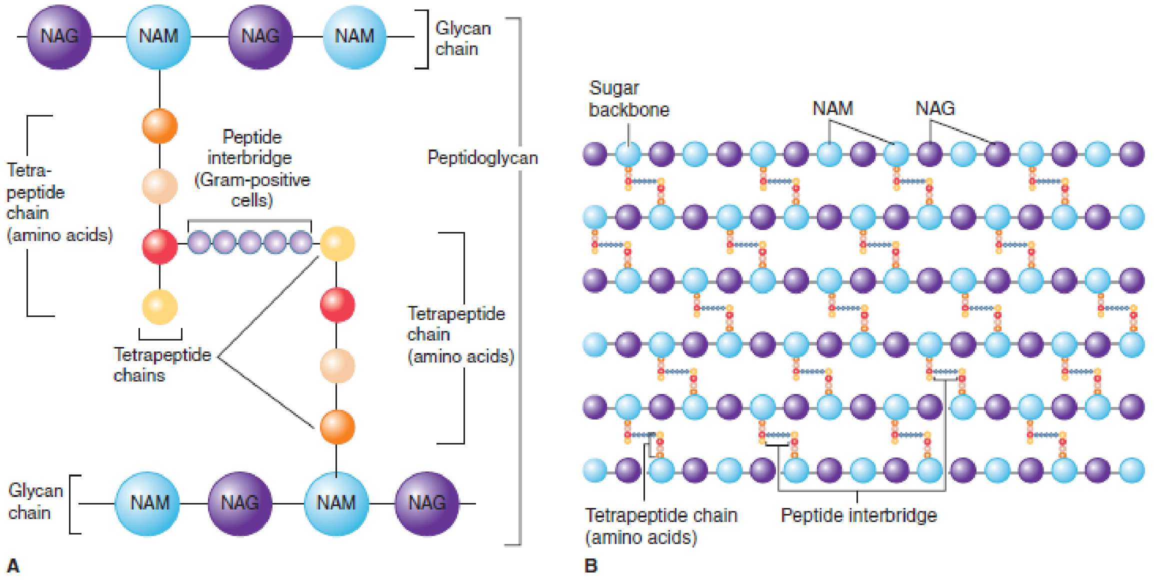
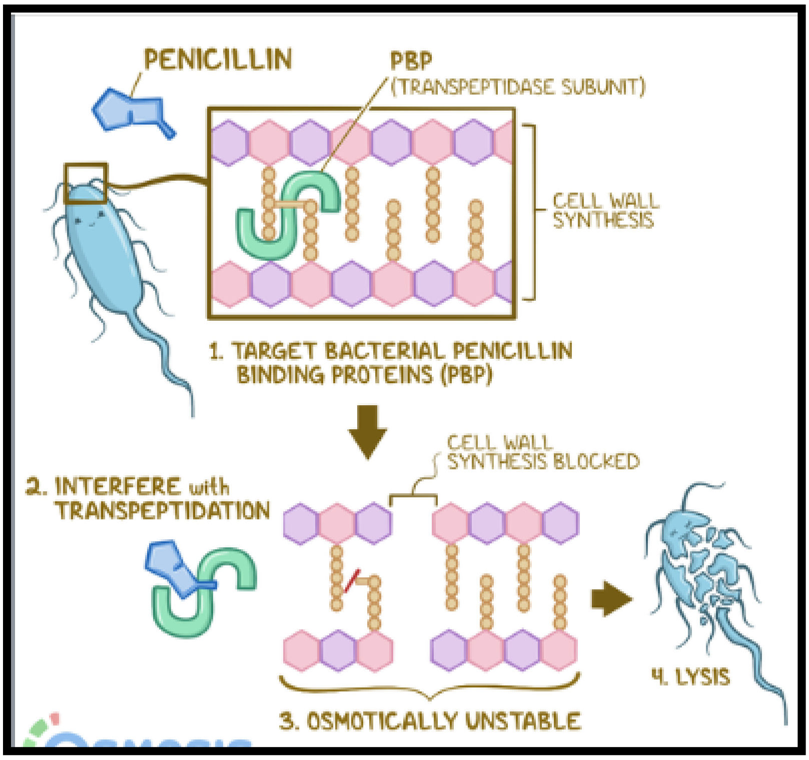

NAG
NAM
NAG
NAM
Glycan chain
Peptidoglycan
Tetra-peptide chain (amino acids)
Peptide interbridge (Gram-positive cells)
Tetrapeptide chains
Tetrapeptide chain (amino acids)
Glycan chain
NAM
NAG
NAM
NAG
A
Sugar backbone
NAM
NAG
Tetrapeptide chain (amino acids)
Peptide interbridge
B

FIGURE 2–5 Peptidoglycan structure. **A:** Peptidoglycan is composed of a glycan chain (NAM and NAG), a tetrapeptide chain, and a cross-link (peptide interbridge). **B:** In the cell wall, the peptidoglycan forms a multilayered, three-dimensional structure. NAG, *N*-acetylglucosamine; NAM, *N*-acetylmuramic acid. (Reproduced with permission from Nester EW et al. *Microbiology: A Human Perspective*. 6th ed. New York, NY: McGraw-Hill; 2009.)


PENICILLIN
PBP
(TRANSPEPTIDASE SUBUNIT)
CELL WALL SYNTHESIS
1. TARGET BACTERIAL PENICILLIN BINDING PROTEINS (PBP)
CELL WALL SYNTHESIS BLOCKED
2. INTERFERE with TRANSPEPTIDATION
4. LYSIS
3. OSMOTICALLY UNSTABLE

254. ‘Red Man ‘syndrome is a well-known adverse effect of

- a) vancomycin
- b) ceftazidime
- c) penicillin G
- d) linezolid

Key a

255. The antibiotic that inhibits protein synthesis by binding to 23 S subunit of the 50 S subunit is

- a) vancomycin
- b) gentamicin
- c) chloramphenicol
- d) linezolid, chloramphinicol, clarithromycin. Clindamycin

Key d

256. Macrolides have a wide spectrum of activity. An important macrolide is

- a) clindamycin
- b) vancomycin
- c) streptomycin
- d) Azithromycin

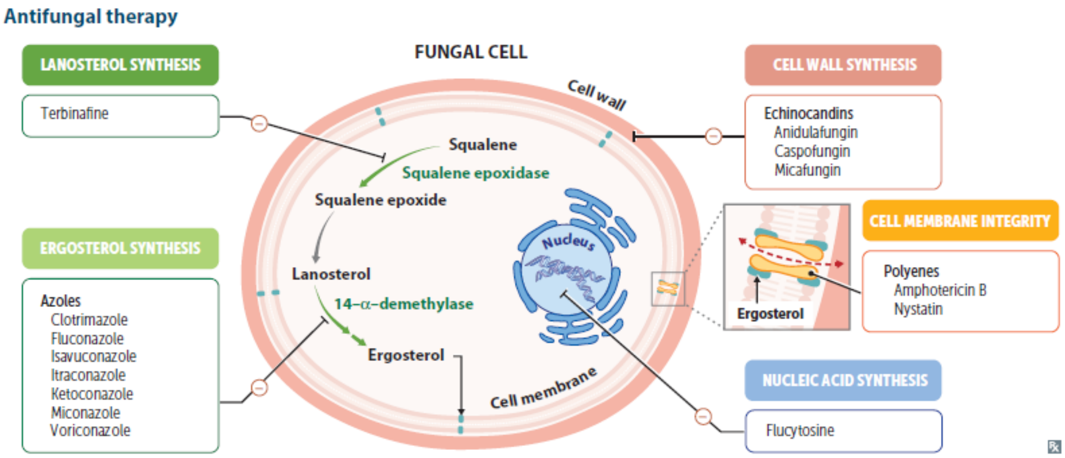
Key d

257. Antibiotics that block fungal cell wall synthesis by blocking the enzyme that synthesizes B- glucan are

- a) Amphotericin B
- b) caspofungin
- c) nystatin
- d) fluconazole

Key CORRECTED = B

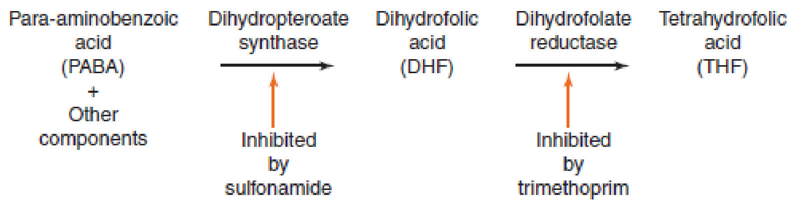
Caspofungin is an echinocandin class antifungal drug that targets and inhibits the enzyme 1,3-β-D-glucan synthase, which is essential for the synthesis of β-glucan, a major component of the fungal cell wall.


Antifungal therapy
FUNGAL CELL
LANOSTEROL SYNTHESIS
Terbinafine
ERGOSTEROL SYNTHESIS
Azoles
Clotrimazole
Fluconazole
Isavuconazole
Itraconazole
Ketoconazole
Miconazole
Voriconazole
Cell wall
Squalene
Squalene epoxidase
Squalene epoxide
Lanosterol
14-α-demethylase
Ergosterol
Nucleus
Cell membrane
CELL WALL SYNTHESIS
Echinocandins
Anidulafungin
Caspofungin
Micafungin
Ergosterol
CELL MEMBRANE INTEGRITY
Polyenes
Amphotericin B
Nystatin
NUCLEIC ACID SYNTHESIS
Flucytosine

258. Structural analogues to PABA are

- a) sulphonamides
- b) monobactams
- c) aminoglycosides
- d) macrolides

Key a


Para-aminobenzoic acid (PABA) + Other components
Dihydropteroate synthase
Inhibited by sulfonamide
Dihydrofolic acid (DHF)
Dihydrofolate reductase
Inhibited by trimethoprim
Tetrahydrofolic acid (THF)

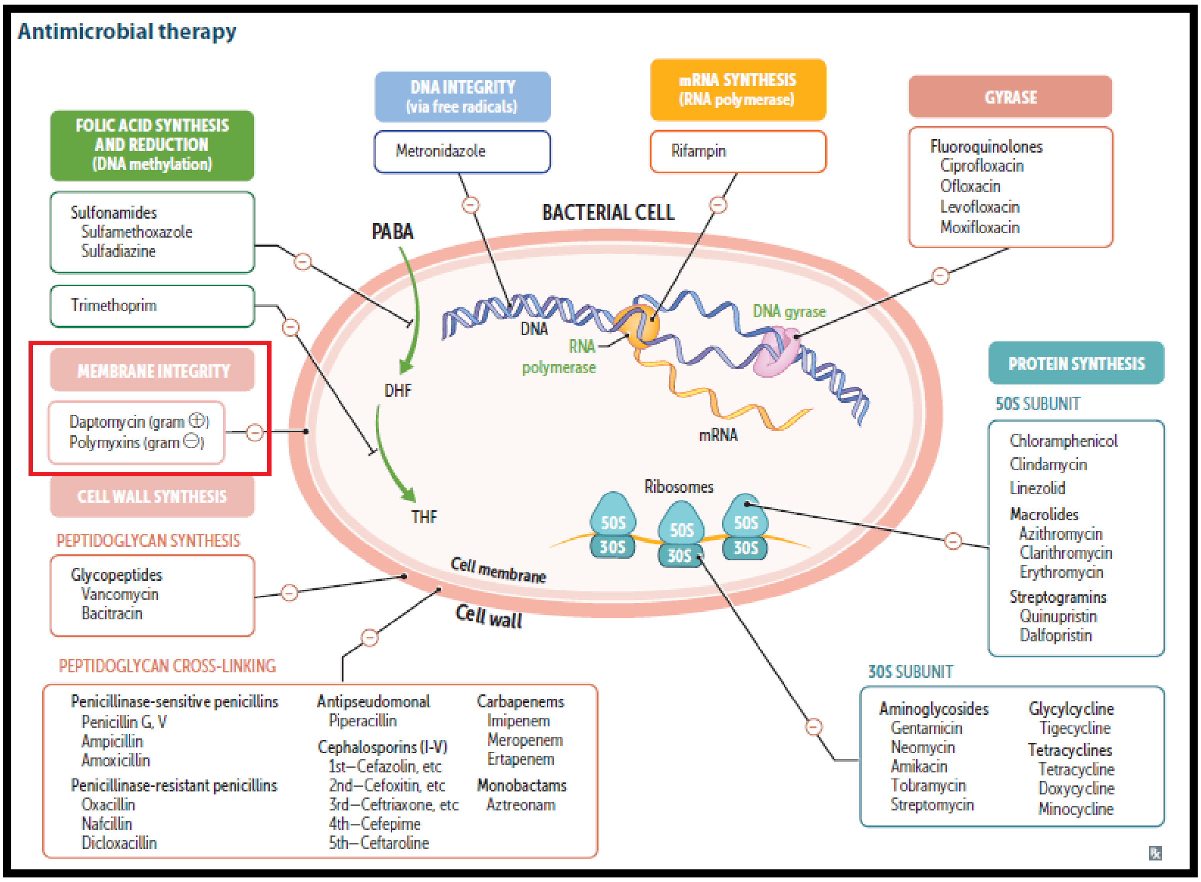
The mode of action of sulfonamides is to block the synthesis of tetrahydrofolic acid, which is required as a methyl donor in the synthesis of the nucleic acid precursors adenine, guanine, and thymine. Sulfonamides are **structural analogues of *p*-aminobenzoic acid** (PABA). PABA condenses with a pteridine compound to form dihydropteroic acid, a precursor of tetrahydrofolic acid (Figure 10–10). Sulfonamides compete with PABA for the active site of the enzyme dihydropteroate synthetase. This competitive inhibition can be overcome by an excess of PABA.

259. Bactericidal drugs that block bacterial DNA synthesis by inhibiting the enzyme DNA gyrase are

a) sulfonamides
b) tetracyclins
c) fluoroquinolones
d) macrolides
Key c

260. Antibiotics that act by altering the bacterial cell membrane are

a) polymixins
b) fluoroquinolones
c) streptogramins
d) tetracyclins
Key a


Antimicrobial therapy

FOLIC ACID SYNTHESIS AND REDUCTION (DNA methylation)
Sulfonamides
Sulfamethoxazole
Sulfadiazine
Trimethoprim
MEMBRANE INTEGRITY
Daptomycin (gram ⊕)
Polymyxins (gram ⊖)
CELL WALL SYNTHESIS
PEPTIDOGLYCAN SYNTHESIS
Glycopeptides
Vancomycin
Bacitracin
PEPTIDOGLYCAN CROSS-LINKING
Penicillinase-sensitive penicillins
Penicillin G, V
Ampicillin
Amoxicillin
Penicillinase-resistant penicillins
Oxacillin
Nafcillin
Dicloxacillin
Antipseudomonal
Piperacillin
Cephalosporins (I-V)
1st–Cefazolin, etc
2nd–Cefoxitin, etc
3rd–Ceftriaxone, etc
4th–Cefepime
5th–Ceftaroline
Carbapenems
Imipenem
Meropenem
Ertapenem
Monobactams
Aztreonam
DNA INTEGRITY (via free radicals)
Metronidazole
mRNA SYNTHESIS (RNA polymerase)
Rifampin
GYRASE
Fluoroquinolones
Ciprofloxacin
Ofloxacin
Levofloxacin
Moxifloxacin
BACTERIAL CELL
PABA
DHF
THF
DNA
RNA polymerase
DNA gyrase
mRNA
Ribosomes
50S
30S
Cell membrane
Cell wall
PROTEIN SYNTHESIS
50S SUBUNIT
Chloramphenicol
Clindamycin
Linezolid
Macrolides
Azithromycin
Clarithromycin
Erythromycin
Streptogramins
Quinupristin
Dalfopristin
30S SUBUNIT
Aminoglycosides
Gentamicin
Neomycin
Amikacin
Tobramycin
Streptomycin
Glycylcycline
Tigecycline
Tetracyclines
Tetracycline
Doxycycline
Minocycline

261. An example of capsular polysaccharide vaccine is

a) BCG
b) OPV
c) Hib
d) DPT
Key CORRECTED = C

The Hib vaccine is a capsular polysaccharide vaccine. It contains purified polysaccharide from the capsule of ***Haemophilus influenzae* type b** bacteria, which helps the immune system recognize and fight the infection.

Here's a brief explanation of the other options:

BCG (Bacillus Calmette–Guérin): This is a live attenuated vaccine for tuberculosis, made from a weakened strain of *Mycobacterium bovis*.

OPV (Oral Polio Vaccine): This is a live attenuated vaccine for poliovirus.

DPT (Diphtheria, Pertussis, Tetanus): This is a combination vaccine that contains inactivated toxins (toxoid vaccines) for diphtheria and tetanus, and an inactivated pertussis vaccine.

262. Another name that can be used for antitoxins is

a) antibiotics
b) immunoglobulins
c) probiotics
d) immunosuppressants
Key b (POOR ☹)

263. BCG is an example of……… vaccine

a) toxoid
b) live attenuated
c) capsular polysaccharide
d) killed
Key b

264. An example of passive-active immunity is seen when giving prophylactic immunization in case of

a) tuberculosis
b) typhoid fever
c) cholera
d) tetanus
Key d

This involves the combination of:

Passive immunity: The administration of **tetanus immune globulin (TIG),** which provides immediate passive protection by supplying pre-formed antibodies to neutralize any tetanus toxin.

Active immunity: The administration of the **tetanus toxoid vaccine**, which stimulates the body to produce its own antibodies for long-term immunity.

265. Prior to taking a blood culture the skin is prepared by primarily using

a) hypochlorite
b) tincture of iodine
c) phenol
d) ethanol
Key b

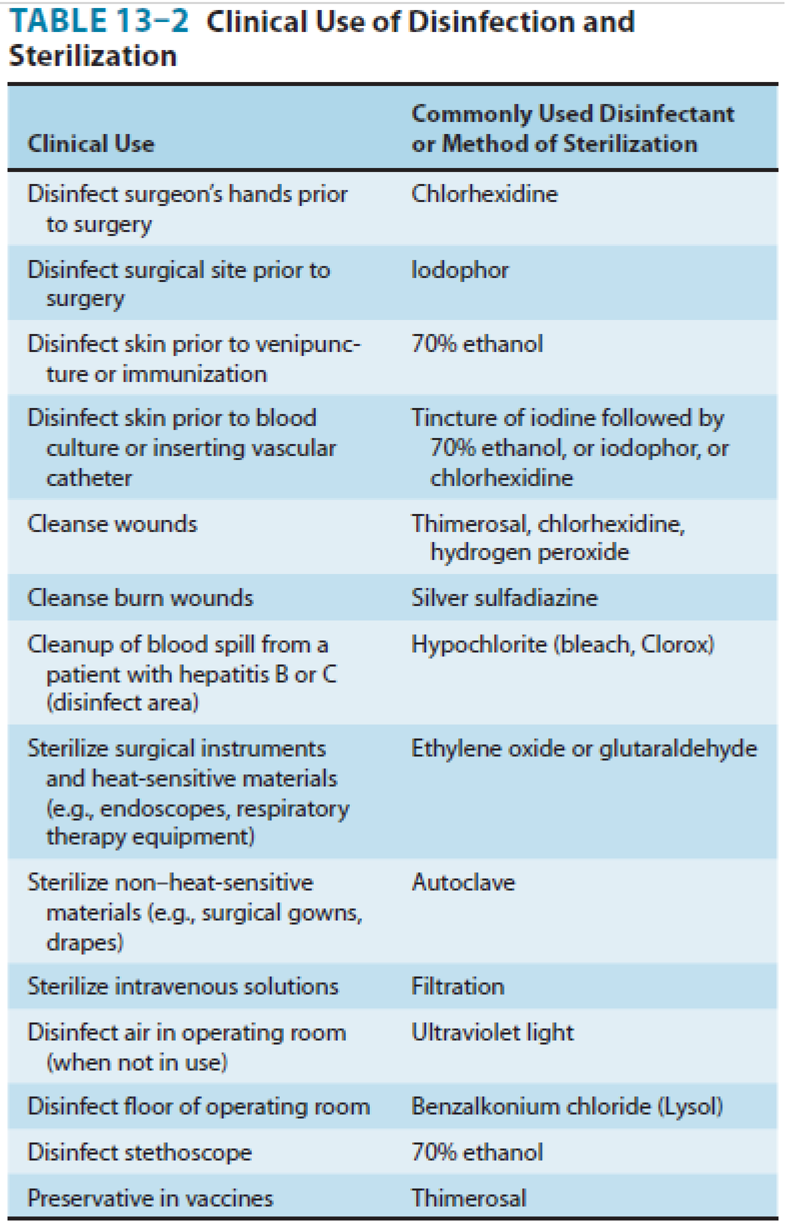


TABLE 13–2 Clinical Use of Disinfection and Sterilization

Clinical Use	Commonly Used Disinfectant or Method of Sterilization
Disinfect surgeon's hands prior to surgery	Chlorhexidine
Disinfect surgical site prior to surgery	Iodophor
Disinfect skin prior to venipuncture or immunization	70% ethanol
Disinfect skin prior to blood culture or inserting vascular catheter	Tincture of iodine followed by 70% ethanol, or iodophor, or chlorhexidine
Cleanse wounds	Thimerosal, chlorhexidine, hydrogen peroxide
Cleanse burn wounds	Silver sulfadiazine
Cleanup of blood spill from a patient with hepatitis B or C (disinfect area)	Hypochlorite (bleach, Clorox)
Sterilize surgical instruments and heat-sensitive materials (e.g., endoscopes, respiratory therapy equipment)	Ethylene oxide or glutaraldehyde
Sterilize non–heat-sensitive materials (e.g., surgical gowns, drapes)	Autoclave
Sterilize intravenous solutions	Filtration
Disinfect air in operating room (when not in use)	Ultraviolet light
Disinfect floor of operating room	Benzalkonium chloride (Lysol)
Disinfect stethoscope	70% ethanol
Preservative in vaccines	Thimerosal

266. The primary test done to differentiate staphylococci from streptococci is

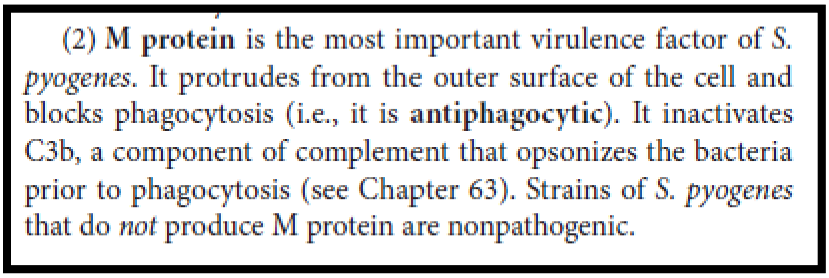
a) catalase
b) oxidase
c) coagulase
d) urease
Key a

267. The main site for colonization in the host for staphylococcus aureus is

a) mouth
b) throat
c) nose
d) skin
Key c

268. The most important virulence factor of streptococcus pyogenes is

a) C carbohydrate
b) streptokinase
c) M protein
d) Hyaluronidase
Key c (IMP)



(2) **M protein** is the most important virulence factor of *S. pyogenes*. It protrudes from the outer surface of the cell and blocks phagocytosis (i.e., it is **antiphagocytic**). It inactivates C3b, a component of complement that opsonizes the bacteria prior to phagocytosis (see Chapter 63). Strains of *S. pyogenes* that do *not* produce M protein are nonpathogenic.

269. The most common cause of infective endocarditis is streptococcus

a) pneumoniae
b) viridans
c) pyogenes
d) agalactiae
Key b

Endocarditis:
IV drugs: S. aureus (acute)
Prosthetics: S. epidermidis
Dental: S. viridans (Subacute)
Colon Ca: S. bovis/S. gallolyticus

270. Bile solubility and sensitivity to Optochin disc confirms the diagnosis of Streptococcus

a) pyogenes
b) agalactiae
c) pneumoniae
d) viridans
Key c

271. Hemorrhagic mediastinitis is a fatal complication seen in infection with

a) bacillus anthracis……. wool sorter disease
b) clostridium tetani
c) corynebacterium diphtheriae
d) clostridium botulinum
Key a

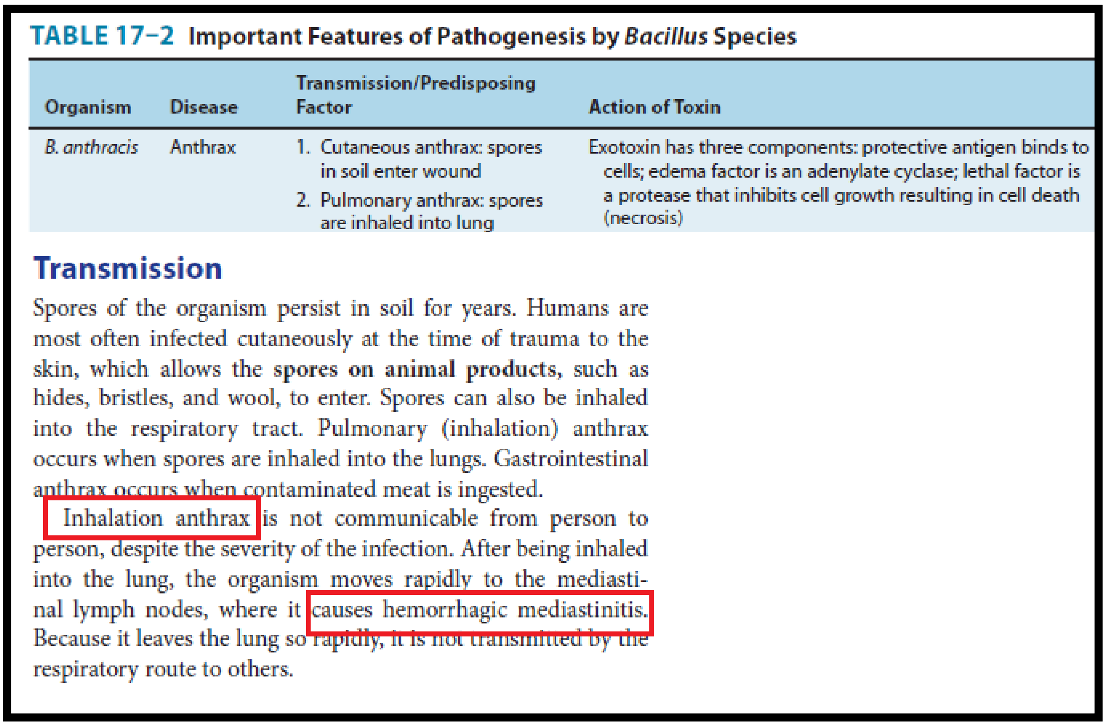


TABLE 17–2 Important Features of Pathogenesis by *Bacillus* Species

Organism	Disease	Transmission/Predisposing Factor	Action of Toxin
B. anthracis	Anthrax	1. Cutaneous anthrax: spores in soil enter wound 2. Pulmonary anthrax: spores are inhaled into lung	Exotoxin has three components: protective antigen binds to cells; edema factor is an adenylate cyclase; lethal factor is a protease that inhibits cell growth resulting in cell death (necrosis)

Transmission

Spores of the organism persist in soil for years. Humans are most often infected cutaneously at the time of trauma to the skin, which allows the **spores on animal products,** such as hides, bristles, and wool, to enter. Spores can also be inhaled into the respiratory tract. Pulmonary (inhalation) anthrax occurs when spores are inhaled into the lungs. Gastrointestinal anthrax occurs when contaminated meat is ingested.

Inhalation anthrax is not communicable from person to person, despite the severity of the infection. After being inhaled into the lung, the organism moves rapidly to the mediastinal lymph nodes, where it causes hemorrhagic mediastinitis. Because it leaves the lung so rapidly, it is not transmitted by the respiratory route to others.

272. 'Cold enhancement' is a feature seen in

a) corynebacterium diphtheriae
b) clostridium difficile
c) bacillus cereus
d) listeria monocytogenes
Key d

"Cold enhancement" is a phenomenon observed with *Listeria monocytogenes*, where the bacterium exhibits increased motility at 4°C (cold temperature), which is not typically seen at higher temperatures. This enhanced motility at lower temperatures is a key characteristic used in laboratory identification of *Listeria monocytogenes*, especially when performing motility tests on solid media.

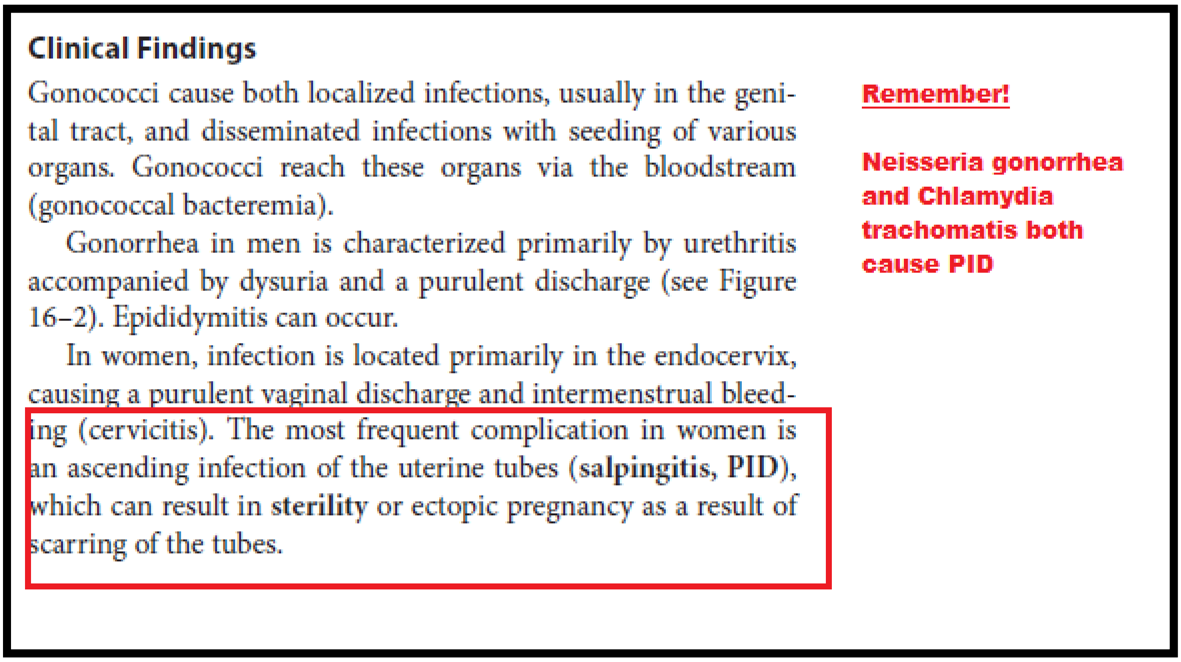
The cold enhancement seen in *Listeria monocytogenes* reflects its ability to adapt to and thrive in cold environments, which is part of its strategy for survival and persistence in both natural and food-related habitats.

273. Bacillus cereus related food poisoning is most frequently associated with the ingestion of

a) meat gravy dishes
b) reheated fried rice
c) unpasteurized cheese
d) canned mushrooms
Key b

274. Salpingitis resulting in sterility is the most frequent complication seen in infection with

a) listeria monocytogenes
b) streptococcus agalactiae
c) neisseria gonorrhoae
d) staphylococcus saprophyticus
Key c



Clinical Findings

Gonococci cause both localized infections, usually in the genital tract, and disseminated infections with seeding of various organs. Gonococci reach these organs via the bloodstream (gonococcal bacteremia).

Gonorrhea in men is characterized primarily by urethritis accompanied by dysuria and a purulent discharge (see Figure 16–2). Epididymitis can occur.

In women, infection is located primarily in the endocervix, causing a purulent vaginal discharge and intermenstrual bleeding (cervicitis). The most frequent complication in women is an ascending infection of the uterine tubes (**salpingitis, PID**), which can result in **sterility** or ectopic pregnancy as a result of scarring of the tubes.

Remember!

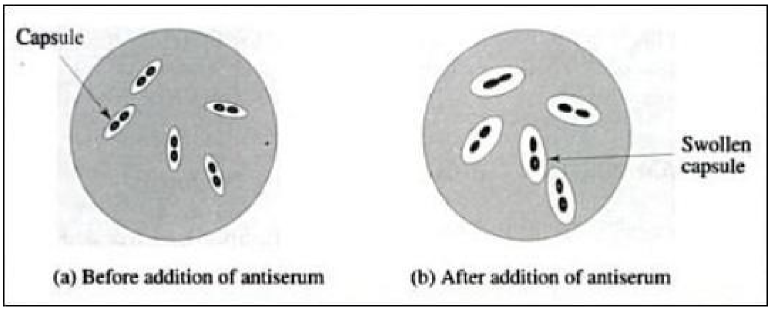
Neisseria gonorrhea and Chlamydia trachomatis both cause PID

275. The Quellung Reaction is performed to detect the prescence of

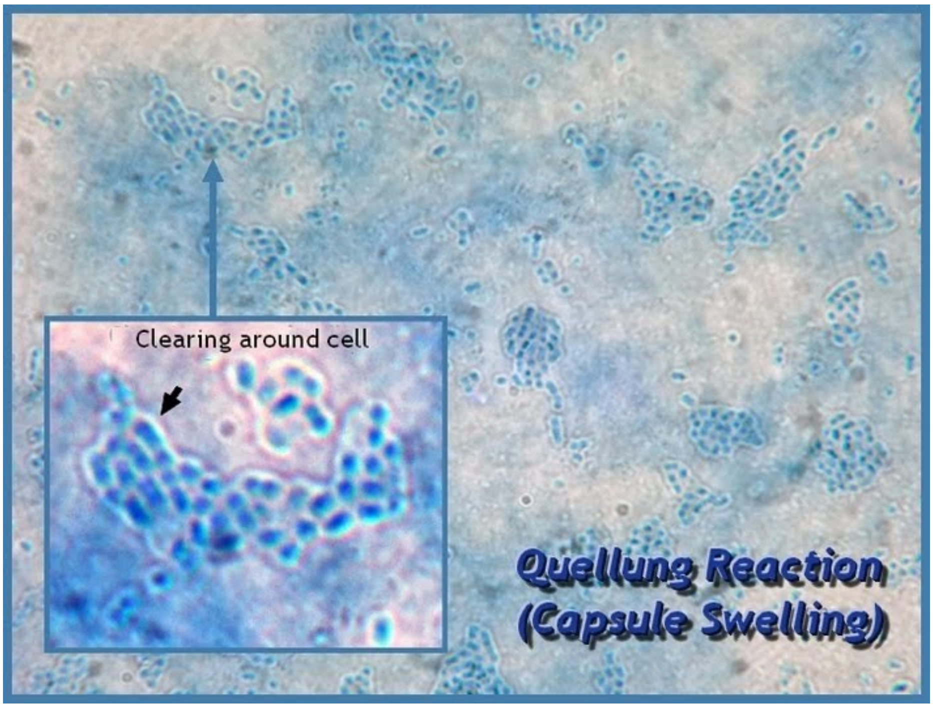
a) Pili
b) Capsule
c) Flagella
d) Spores
Key b

The Quellung reaction is specifically used to identify the presence of a capsule. In this test, bacteria are exposed to specific antisera that cause the capsule to swell, making it more visible under a microscope. This reaction is commonly used for identification of encapsulated bacteria such as Streptococcus pneumoniae and

Haemophilus influenzae.



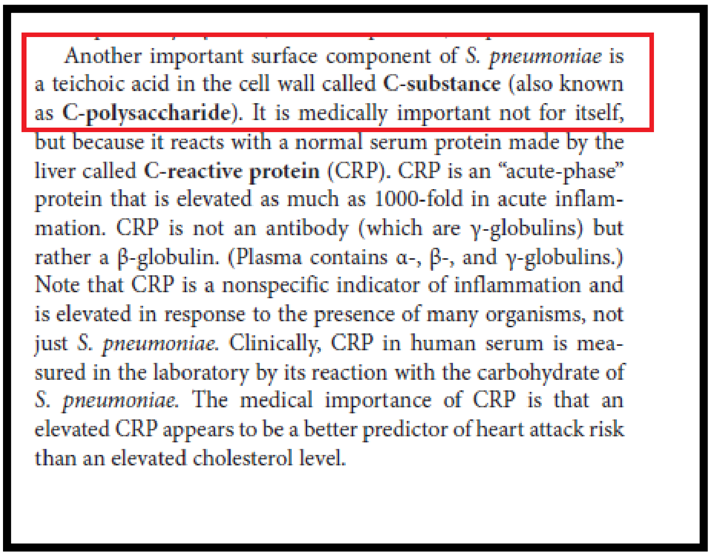
(a) Before addition of antiserum (b) After addition of antiserum



276. C-substance also known as C-peptide is an important component of

a) streptococcus pneumoniae
b) staphylococcus epidermidis
c) streptococcus pyogenes
d) streptococcus agalactiae

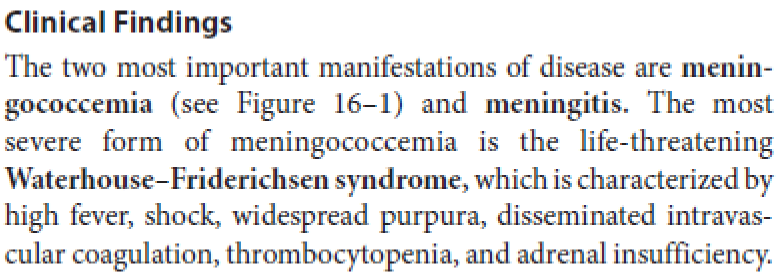
Key a



Another important surface component of *S. pneumoniae* is a teichoic acid in the cell wall called **C-substance** (also known as **C-polysaccharide**). It is medically important not for itself, but because it reacts with a normal serum protein made by the liver called **C-reactive protein** (CRP). CRP is an "acute-phase" protein that is elevated as much as 1000-fold in acute inflammation. CRP is not an antibody (which are γ-globulins) but rather a β-globulin. (Plasma contains α-, β-, and γ-globulins.) Note that CRP is a nonspecific indicator of inflammation and is elevated in response to the presence of many organisms, not just *S. pneumoniae*. Clinically, CRP in human serum is measured in the laboratory by its reaction with the carbohydrate of *S. pneumoniae*. The medical importance of CRP is that an elevated CRP appears to be a better predictor of heart attack risk than an elevated cholesterol level.

277. Water-House Friedrichsen syndrome is a complication seen with infection of

a) enterohemorrhagic E. coli
b) streptococcus pyogenes
c) methicillin resistant staphylococcus aureus
d) Neisseria meningitides
Key d

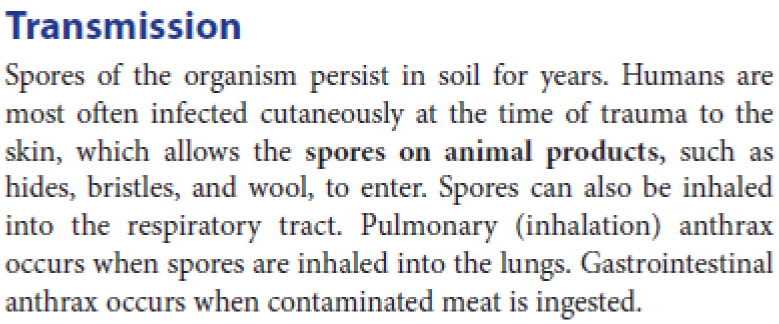


Clinical Findings

The two most important manifestations of disease are **meningococcemia** (see Figure 16–1) and **meningitis.** The most severe form of meningococcemia is the life-threatening **Waterhouse–Friderichsen syndrome,** which is characterized by high fever, shock, widespread purpura, disseminated intravascular coagulation, thrombocytopenia, and adrenal insufficiency.

278. 'Wool sorter's disease' is caused by

a) prevotella melaninogenica
b) Clostridium perfringens
c) bacillus anthracis
d) brucella melitensis
Key c



Transmission

Spores of the organism persist in soil for years. Humans are most often infected cutaneously at the time of trauma to the skin, which allows the **spores on animal products,** such as hides, bristles, and wool, to enter. Spores can also be inhaled into the respiratory tract. Pulmonary (inhalation) anthrax occurs when spores are inhaled into the lungs. Gastrointestinal anthrax occurs when contaminated meat is ingested.

Bacillus anthracis is through contact with infected animals or animal products, such as wool, hides, or hair.

People who handle wool, particularly in the sorting process, are at risk of inhaling anthrax spores, which can lead to pulmonary anthrax, also known as Wool Sorter's Disease.

279. Hemolytic-uremic syndrome occurs as a complication of infection with

a) shigella dysenteriae
b) campylobacter jejuni
c) vibrio parahemolyticus
d) enterohemorrhagic E coli (EHEC) O157:H7
Key d

☐ **Enteropathogenic E. coli (EPEC):**
Cause of infantile diarrhea (especially in developing countries).

☐ **Enterotoxigenic E. coli (ETEC):**
Major cause of traveler's diarrhea.

Produces heat-labile toxin (LT) and heat-stable toxin (ST).
Causes watery diarrhea (not bloody).
Transmitted via contaminated water and food.

☐ **Enterohemorrhagic E. coli (EHEC):**
Associated with bloody diarrhea and hemorrhagic colitis.
Can lead to hemolytic uremic syndrome (HUS).
Often caused by Shiga toxins (Stx1 and Stx2).
Common source: undercooked ground beef (especially O157:H7 strain). SMAC will appear as NLF

☐ **Enteroinvasive E. coli (EIEC):**
Causes dysentery (bloody diarrhea with fever).
Invades and destroys colonic epithelial cells.
Similar to Shigella in terms of pathogenicity.

☐ **Neonatal meningitis E. coli (NMEC):**
Cause of neonatal meningitis.
Associated with K1 capsular antigen.

280. ‘Cold enrichment/ enhancement’ is done to facilitate the growth of

a) listeria monocytogenes
b) legionella pneumophila
c) campylobacter intestinalis
d) corynebacterium diphtheria

Key a

281. ‘Rose spots’ are seen in infection with

a) shigella dysenteriae
b) salmonella typhi
c) Streptococcus pneumoniae
d) vibrio cholerae

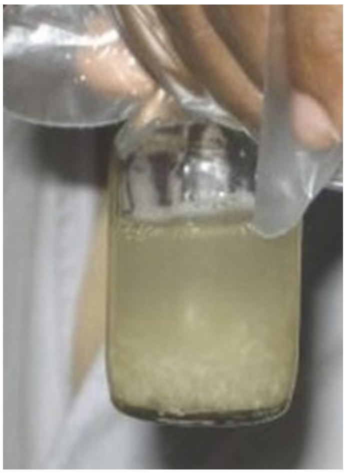
Key b

Rose Spots are reddish-pink spots that appear on the skin, usually on the abdomen or chest, in patients with typhoid fever. The spots are typically 2-4 mm in diameter and may fade after a few days. They are due to vascular changes in the skin caused by Salmonella bacteria.

282. ‘Rice water stools’ are seen in infection with

a) salmonella enteritidis
b) vibrio cholerae
c) enterotoxigenic E coli
d) bacillus cereus

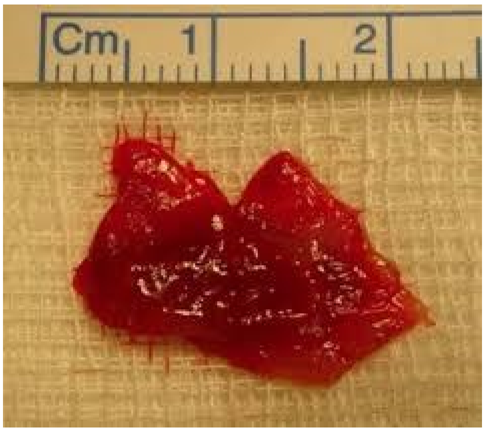
Key b



283. 'Currant jelly' sputum is seen in patients with pneumonia caused by

a) Escherichia coli
b) serratia marscecens
c) klebsiella pneumoniae
d) pseudomonas aeruginosa

Key c



- **Klebsiella pneumoniae** is a **Gram-negative bacterium** that is known to cause **lobar pneumonia**, particularly in **alcoholics, diabetics**, and **immunocompromised individuals**.

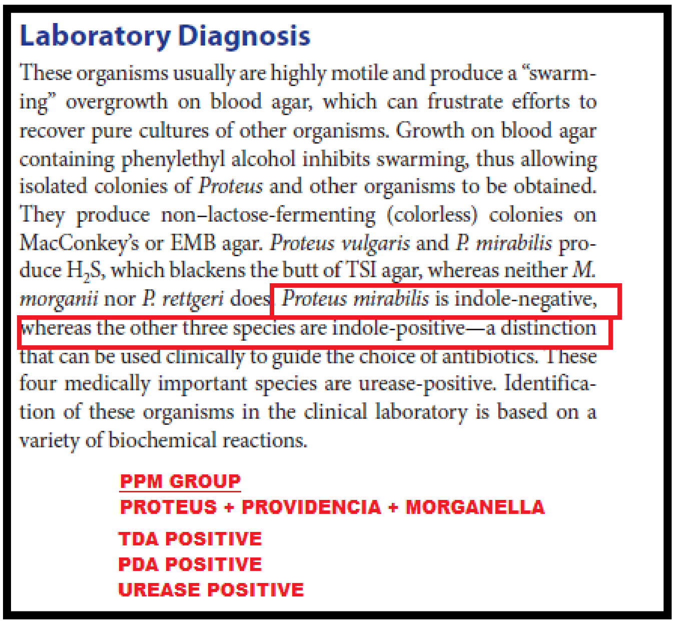
- The term **"currant jelly sputum"** refers to a **thick, dark red**, or **bloody sputum** that resembles the appearance of currant jelly, often due to the presence of **blood** and **mucus**.

- This appearance is caused by **necrosis** of lung tissue and the accumulation of **blood** within the alveoli, a common feature of **Klebsiella pneumoniae** infections.

284. Indole negative, Urease positive gram-negative rod is

a) proteus mirabilis (indole negative, h2s producer ,catalase positive, methyl red positive VP negative)
b) providencia rettgeri
c) proteus vulgaris
d) morganella morganii

Key a



Laboratory Diagnosis

These organisms usually are highly motile and produce a "swarming" overgrowth on blood agar, which can frustrate efforts to recover pure cultures of other organisms. Growth on blood agar containing phenylethyl alcohol inhibits swarming, thus allowing isolated colonies of *Proteus* and other organisms to be obtained. They produce non–lactose-fermenting (colorless) colonies on MacConkey's or EMB agar. *Proteus vulgaris* and *P. mirabilis* produce H_2S, which blackens the butt of TSI agar, whereas neither *M. morganii* nor *P. rettgeri* does. *Proteus mirabilis* is indole-negative, whereas the other three species are indole-positive—a distinction that can be used clinically to guide the choice of antibiotics. These four medically important species are urease-positive. Identification of these organisms in the clinical laboratory is based on a variety of biochemical reactions.

PPM GROUP
PROTEUS + PROVIDENCIA + MORGANELLA

TDA POSITIVE
PDA POSITIVE
UREASE POSITIVE

285. Oxidase positive strict aerobic gram-negative rod is

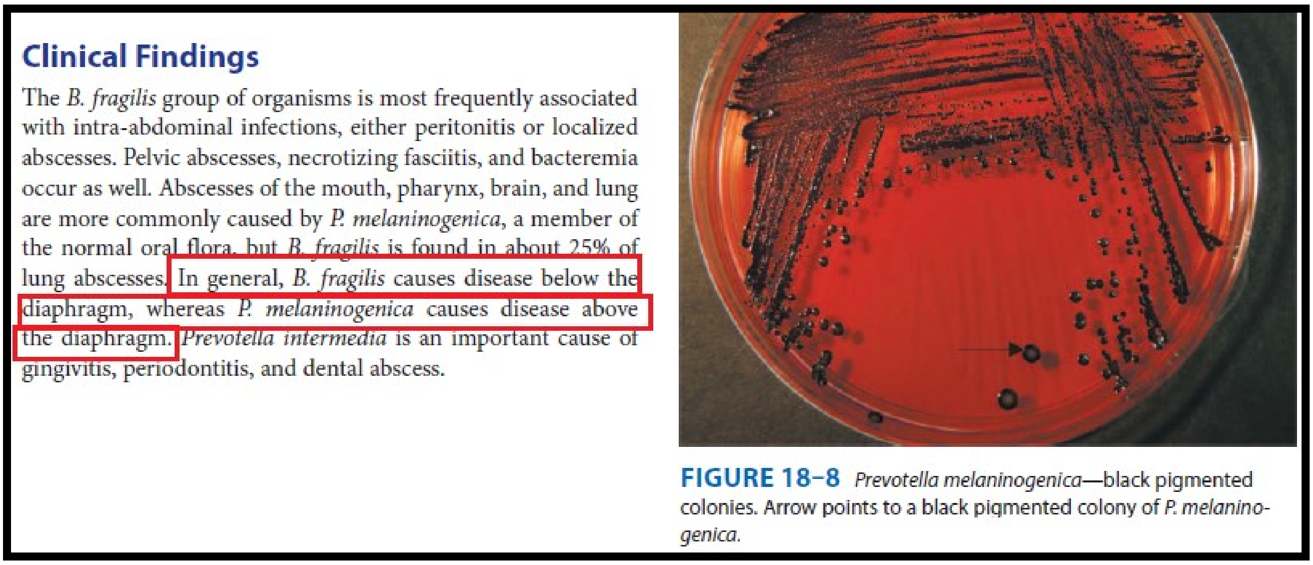
a) vibrio cholerae
b) pseudomonas aeruginosa
c) helicobacter pylori
d) prevotella melaninogenica

Keyb

286. The most probable cause of a dental abscess is

a) Staphylococcus aureus
b) eikinella corrodens
c) streptococcus mitis
d) prevotella melaninogenica

Key c CORRECTED D



Clinical Findings

The *B. fragilis* group of organisms is most frequently associated with intra-abdominal infections, either peritonitis or localized abscesses. Pelvic abscesses, necrotizing fasciitis, and bacteremia occur as well. Abscesses of the mouth, pharynx, brain, and lung are more commonly caused by *P. melaninogenica*, a member of the normal oral flora, but *B. fragilis* is found in about 25% of lung abscesses. In general, *B. fragilis* causes disease below the diaphragm, whereas *P. melaninogenica* causes disease above the diaphragm. *Prevotella intermedia* is an important cause of gingivitis, periodontitis, and dental abscess.

FIGURE 18–8 *Prevotella melaninogenica*—black pigmented colonies. Arrow points to a black pigmented colony of *P. melaninogenica.*

287. M-protein is a virulence factor of

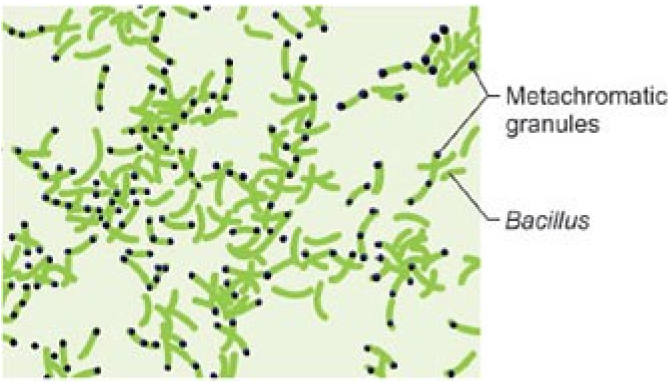
a) corynebacterium diphtheriae
b) Streptococus pyogenes
c) clostridium tetani
d) bordetella pertussis

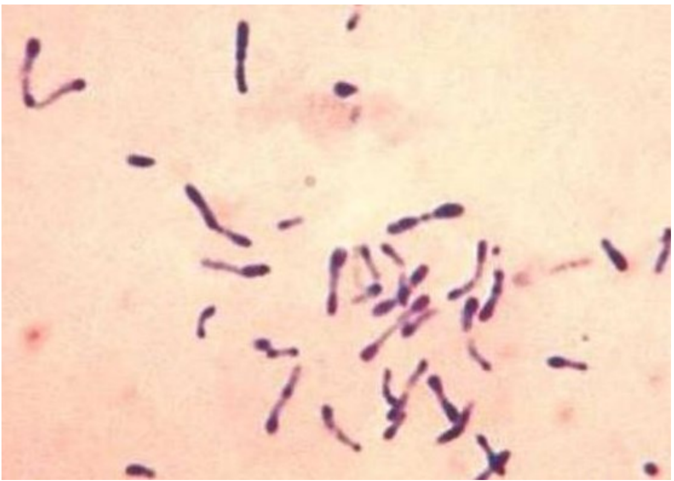
Key b

288. Volutin granules / metachromatic granules are seen in infection with

a) bordetella pertussis
b) bacillus anthracis
c) corynebacterium diphtheriae
d) legionella pneumophila

Key c



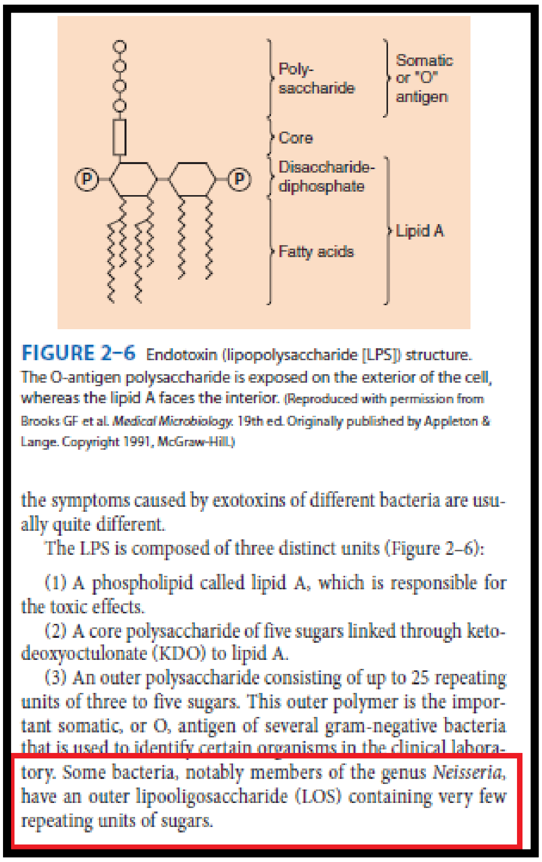


Volutin granules (also known as metachromatic granules) are intracellular inclusions composed of polyphosphate reserves that appear as reddish-purple when stained with dyes like methylene blue (In Kleb's loefller bacillus or KLB stain) or Albert's stain.

289. A common cause of meningitis in neonates is
a) streptococcus viridans
b) streptococcus agalactiae
c) streptococcus pyogenes
d) streptococcus bovis
Key b

Just remember the mnemonic " B E L" for neonatal meningitis = Group B streptococcus, Escherichia coli and Listeria monocytogenes

290. Lipo oligosaccharide (LOS) is found as an integral part of cell wall of
a) enterococus faecalis
b) streptococcus pyogenes
c) methicillin resistant staphylococcus aureus
d) Neisseria gonorrhea AND meningitidis
Key d



P
P
Poly-saccharide
Somatic or "O" antigen
Core
Disaccharide-diphosphate
Lipid A
Fatty acids

FIGURE 2–6 Endotoxin (lipopolysaccharide [LPS]) structure. The O-antigen polysaccharide is exposed on the exterior of the cell, whereas the lipid A faces the interior. (Reproduced with permission from Brooks GF et al. *Medical Microbiology*. 19th ed. Originally published by Appleton & Lange. Copyright 1991, McGraw-Hill.)

the symptoms caused by exotoxins of different bacteria are usually quite different.

The LPS is composed of three distinct units (Figure 2–6):

(1) A phospholipid called lipid A, which is responsible for the toxic effects.

(2) A core polysaccharide of five sugars linked through ketodeoxyoctulonate (KDO) to lipid A.

(3) An outer polysaccharide consisting of up to 25 repeating units of three to five sugars. This outer polymer is the important somatic, or O, antigen of several gram-negative bacteria that is used to identify certain organisms in the clinical laboratory. Some bacteria, notably members of the genus *Neisseria*, have an outer lipooligosaccharide (LOS) containing very few repeating units of sugars.

291. Capsule made of D-glutamate is found in
a) clostridium tetani
b) Corynebacterium diphtheriae
c) bacillus anthracis
d) brucella melitensis
Key c

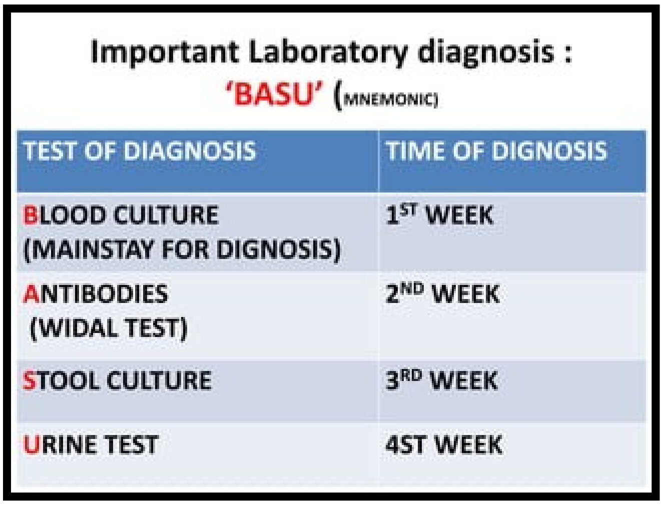
292. Gas gangrene is caused by
a) clostridium botulinum
b) bacteroides fragilis
c) streptococcus pyogenes
d) clostridium perfringens
Key d

293. 'Traveller's diarrhea' is caused by
a) Salmonella enteritides
b) Enteropathogenic E.coli

c) Enterotoxigenic E.coli
d) Staphylococcal enterotoxin
Key c (T for traveler = T for enteroToxigenic)

294. The best specimen for culture for diagnosis of typhoid fever in the first ten days is

a) CSF
b) blood
c) stool
d) urine
Key b



Important Laboratory diagnosis :
'BASU' (MNEMONIC)

TEST OF DIAGNOSIS	TIME OF DIGNOSIS
BLOOD CULTURE (MAINSTAY FOR DIGNOSIS)	1^{ST} WEEK
ANTIBODIES (WIDAL TEST)	2^{ND} WEEK
STOOL CULTURE	3^{RD} WEEK
URINE TEST	4ST WEEK

295. Watery diarrhea associated with eating raw or improperly cooked sea food is caused by

a) salmonella enteritidis
b) clostridium perfringens
c) bacillus cereus
d) vibrio parahemolyticus
Key d

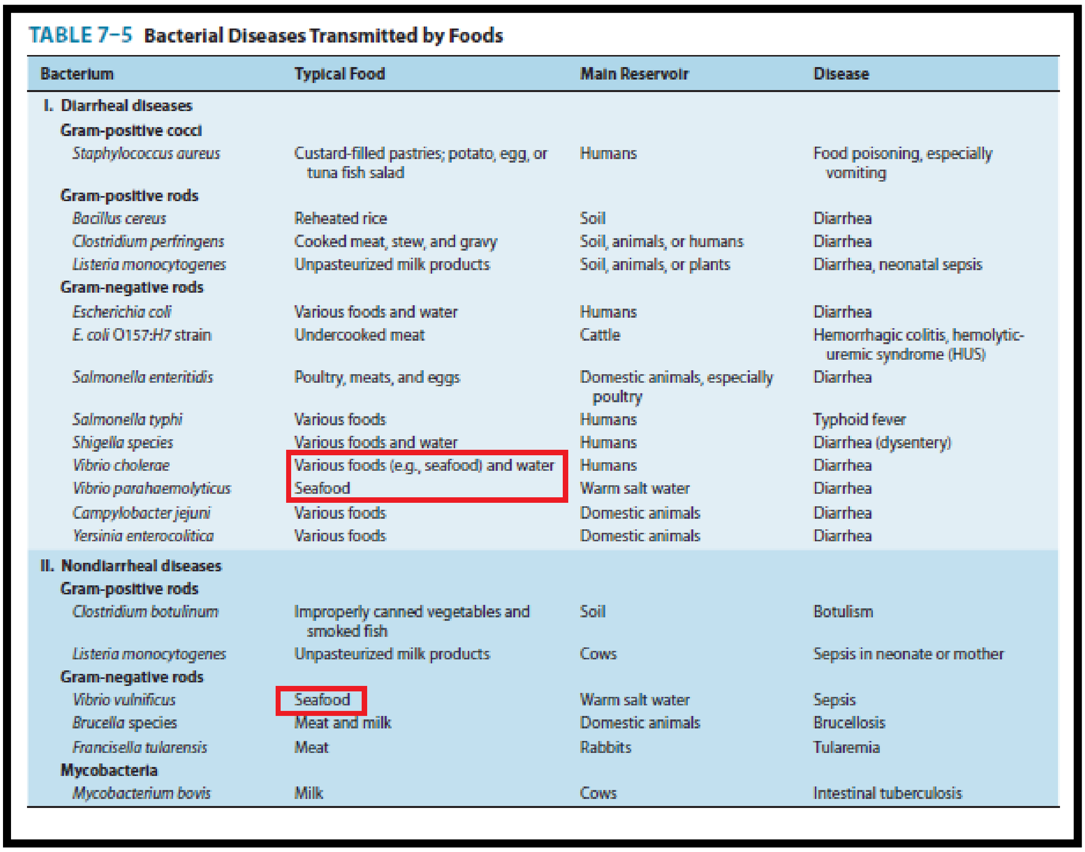


TABLE 7–5 Bacterial Diseases Transmitted by Foods

Bacterium	Typical Food	Main Reservoir	Disease
I. Diarrheal diseases			
Gram-positive cocci			
Staphylococcus aureus	Custard-filled pastries; potato, egg, or tuna fish salad	Humans	Food poisoning, especially vomiting
Gram-positive rods			
Bacillus cereus	Reheated rice	Soil	Diarrhea
Clostridium perfringens	Cooked meat, stew, and gravy	Soil, animals, or humans	Diarrhea
Listeria monocytogenes	Unpasteurized milk products	Soil, animals, or plants	Diarrhea, neonatal sepsis
Gram-negative rods			
Escherichia coli	Various foods and water	Humans	Diarrhea
E. coli O157:H7 strain	Undercooked meat	Cattle	Hemorrhagic colitis, hemolytic-uremic syndrome (HUS)
Salmonella enteritidis	Poultry, meats, and eggs	Domestic animals, especially poultry	Diarrhea
Salmonella typhi	Various foods	Humans	Typhoid fever
Shigella species	Various foods and water	Humans	Diarrhea (dysentery)
Vibrio cholerae	Various foods (e.g., seafood) and water	Humans	Diarrhea
Vibrio parahaemolyticus	Seafood	Warm salt water	Diarrhea
Campylobacter jejuni	Various foods	Domestic animals	Diarrhea
Yersinia enterocolitica	Various foods	Domestic animals	Diarrhea
II. Nondiarrheal diseases			
Gram-positive rods			
Clostridium botulinum	Improperly canned vegetables and smoked fish	Soil	Botulism
Listeria monocytogenes	Unpasteurized milk products	Cows	Sepsis in neonate or mother
Gram-negative rods			
Vibrio vulnificus	Seafood	Warm salt water	Sepsis
Brucella species	Meat and milk	Domestic animals	Brucellosis
Francisella tularensis	Meat	Rabbits	Tularemia
Mycobacteria			
Mycobacterium bovis	Milk	Cows	Intestinal tuberculosis

296. Microaerophilic gram negative rod is

a) campylobacter intestinalis
b) bacteroides fragilis
c) prevotella melaninogenica
d) pseudomonas aeruginosa

Key a

Campylobacter species, including *Campylobacter intestinalis*, are microaerophilic (requiring low oxygen levels) and gram-negative rods. They thrive in environments with reduced oxygen (5-10%) and increased carbon dioxide (10%)

297. Pyocyanin is a virulence factor produced by

a) Pseudomonas aeruginosa
b) Bacteroides fragilis
c) Proteus mirabilis
d) Providencia rettgeri

Key a

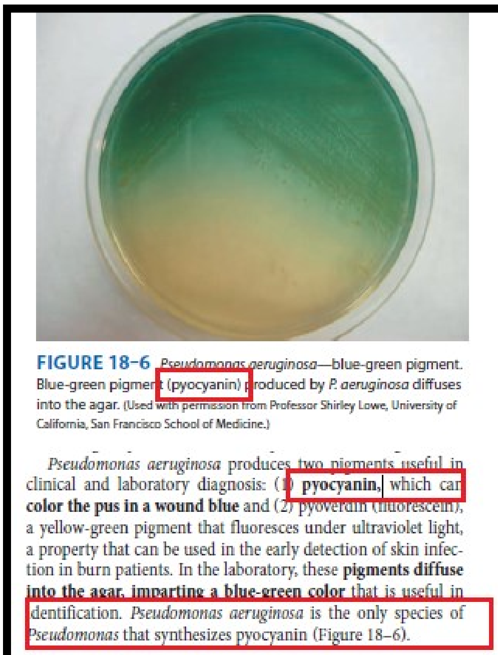
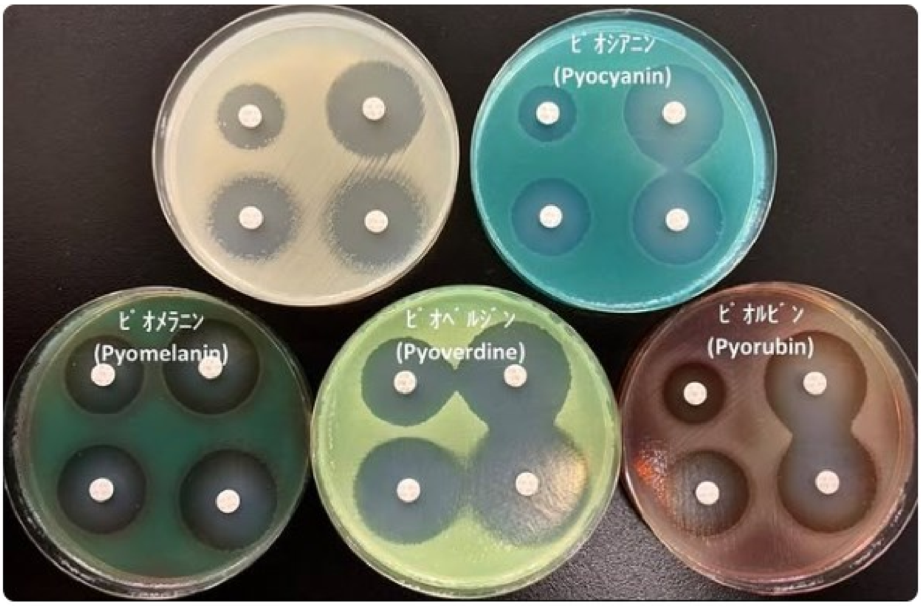


FIGURE 18–6 *Pseudomonas aeruginosa*—blue-green pigment. Blue-green pigment (pyocyanin) produced by *P. aeruginosa* diffuses into the agar. (Used with permission from Professor Shirley Lowe, University of California, San Francisco School of Medicine.)

Pseudomonas aeruginosa produces two pigments useful in clinical and laboratory diagnosis: (1) **pyocyanin,** which can **color the pus in a wound blue** and (2) pyoverdin (fluorescein), a yellow-green pigment that fluoresces under ultraviolet light, a property that can be used in the early detection of skin infection in burn patients. In the laboratory, these **pigments diffuse into the agar, imparting a blue-green color** that is useful in dentification. *Pseudomonas aeruginosa* is the only species of *Pseudomonas* that synthesizes pyocyanin (Figure 18–6).



298. The Phospholipid called Lipid A is an integral part of

a) lipopolysaccharide
b) teichoic acid
c) peptidoglycan
d) polysaccharide capsule

Key a

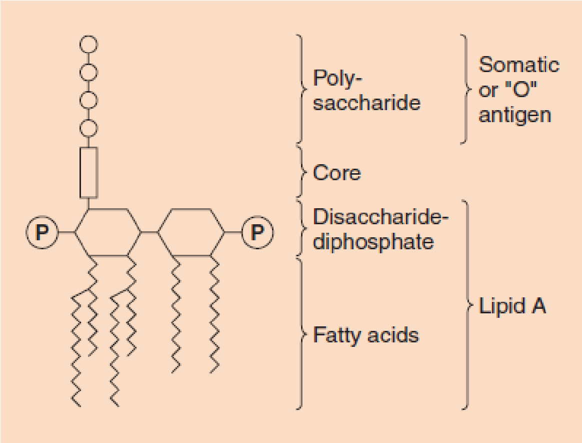


FIGURE 2–6 Endotoxin (lipopolysaccharide [LPS]) structure. The O-antigen polysaccharide is exposed on the exterior of the cell, whereas the lipid A faces the interior.

299. A bacterial structure that is found only in gram positive cell wall is

a) lipopoysaccharide
b) peptidoglycan
c) teichoic acid
d) fertility plasmid

Key c

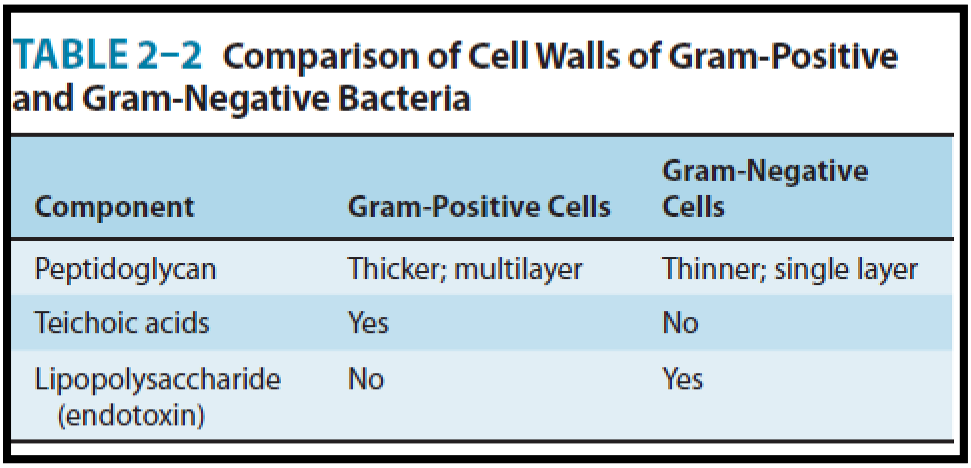


TABLE 2–2 Comparison of Cell Walls of Gram-Positive and Gram-Negative Bacteria

Component	Gram-Positive Cells	Gram-Negative Cells
Peptidoglycan	Thicker; multilayer	Thinner; single layer
Teichoic acids	Yes	No
Lipopolysaccharide (endotoxin)	No	Yes

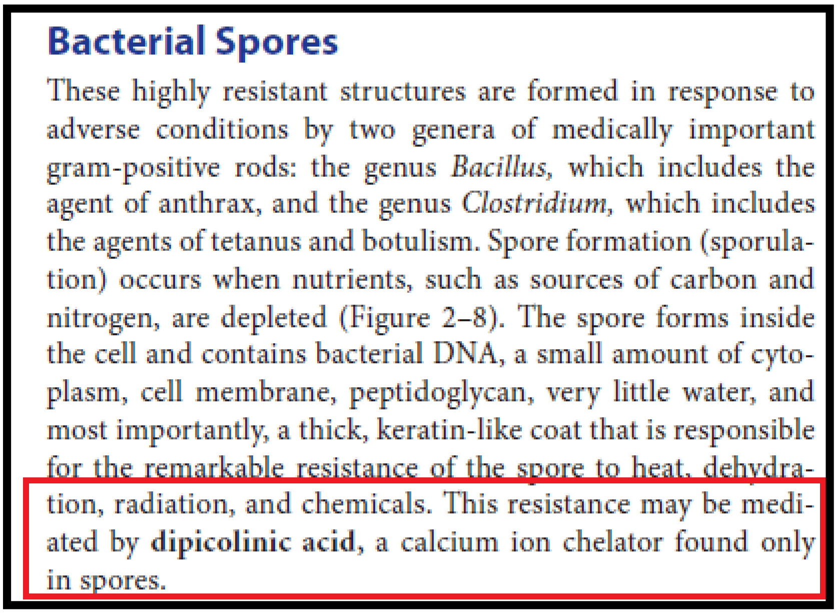
300. Extra- chromosomal double stranded circular DNA molecules are also called
- a) nucleoid
- b) plasmids
- c) nucleosomes
- d) transposons

Key b

Plasmids are extrachromosomal, double-stranded, circular DNA molecules that are capable of replicating independently of the bacterial chromosome.

301. Di picolinic Acid is a calcium chelator found only in
- a) endo toxin
- b) spores
- c) exotoxin
- d) capsule

Key b



Bacterial Spores

These highly resistant structures are formed in response to adverse conditions by two genera of medically important gram-positive rods: the genus *Bacillus*, which includes the agent of anthrax, and the genus *Clostridium*, which includes the agents of tetanus and botulism. Spore formation (sporulation) occurs when nutrients, such as sources of carbon and nitrogen, are depleted (Figure 2–8). The spore forms inside the cell and contains bacterial DNA, a small amount of cytoplasm, cell membrane, peptidoglycan, very little water, and most importantly, a thick, keratin-like coat that is responsible for the remarkable resistance of the spore to heat, dehydration, radiation, and chemicals. This resistance may be mediated by **dipicolinic acid**, a calcium ion chelator found only in spores.

302. Infective Endocarditis is seen in infection with
- a) proteus mirabilis
- b) Escherichia coli
- c) staphylococcus saprophyticus
- d) enterococcus faecium

Key ANSWER CORREECTED = D

303. In a typical bacterial growth cycle, a steady state is achieved during.............phase.

a) Lag
b) Log
c) Stationary
d) Death

Key c

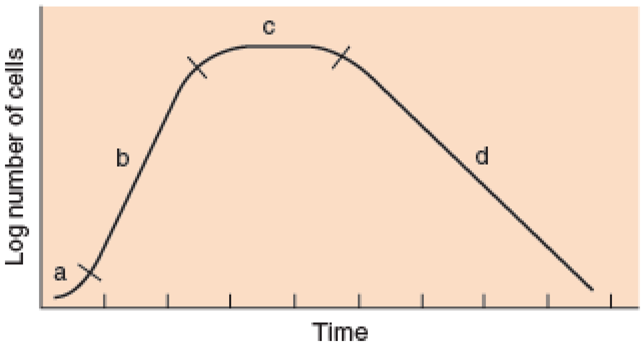


FIGURE 3–1 Growth curve of bacteria: a, lag phase; b, log phase; c, stationary phase; d, death phase. (Reproduced with permission from Joklik WK et al. *Zinsser Microbiology*. 20th ed. Originally published by Appleton & Lange. Copyright 1992, McGraw-Hill.)

(3) The **stationary** phase occurs when nutrient depletion or toxic products cause growth to slow until the number of new cells produced balances the number of cells that die, resulting in a steady state.

304. In bacterial genetics, a plasmid fertility is required to control the process of

a) Conjugation
b) Transduction
c) Transformation
d) Transfection

Key a

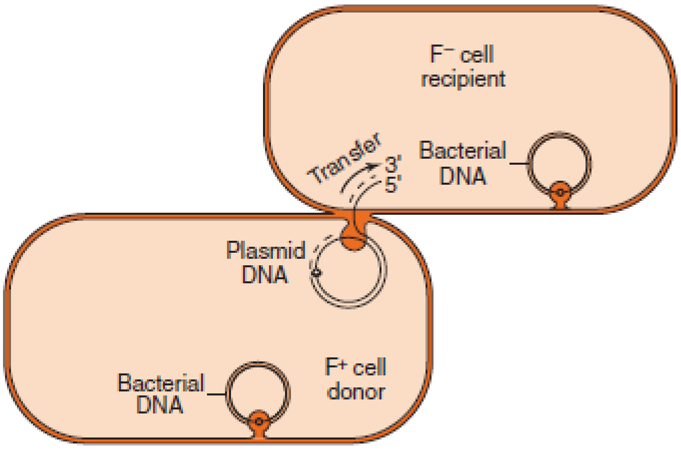


FIGURE 4–2 Conjugation. An F plasmid is being transferred from an F$^+$ donor bacterium to an F$^-$ recipient. The transfer is at the contact site made by the sex pilus.

305. In bacterial genetics, lysogenic conversion occurs during the process of

a) Conjugation

b) Transduction
c) Transformation
d) Transfection
Key b

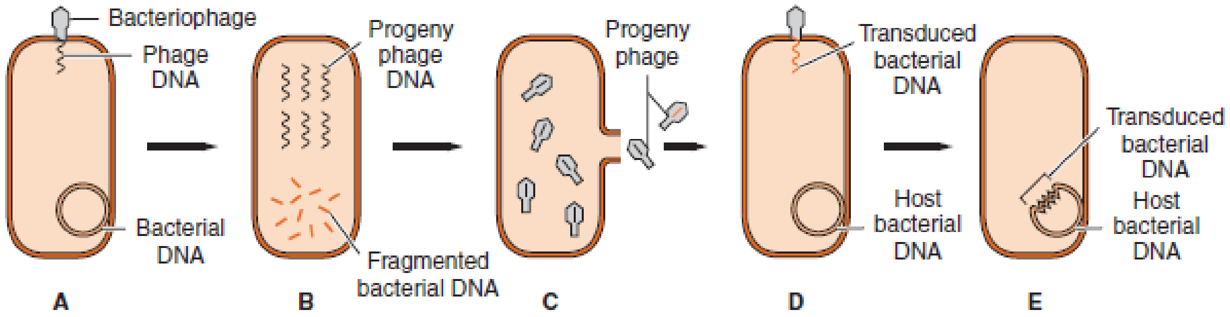
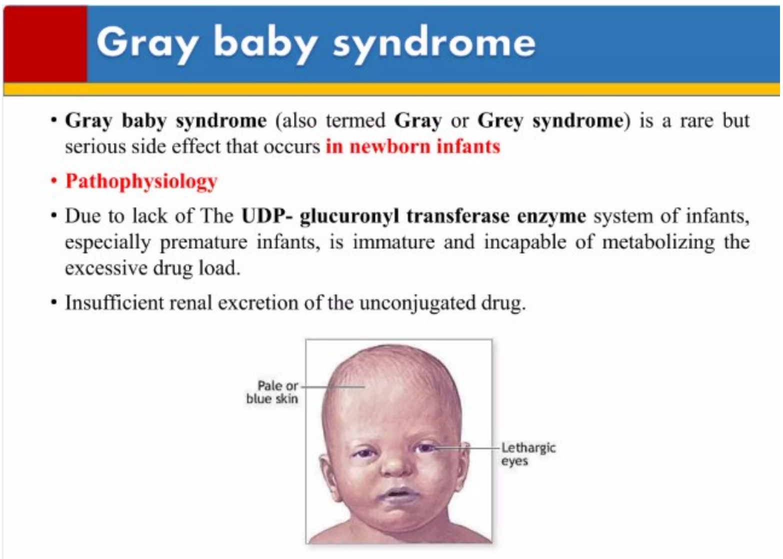

Bacteriophage
Phage DNA
Bacterial DNA
Progeny phage DNA
Fragmented bacterial DNA
Progeny phage
Transduced bacterial DNA
Host bacterial DNA
Transduced bacterial DNA
Host bacterial DNA
A
B
C
D
E

FIGURE 4–4 Transduction. **A:** A bacteriophage infects a bacterium, and phage DNA enters the cell. **B:** The phage DNA replicates, and the bacterial DNA fragments. **C:** The progeny phages assemble and are released; most contain phage DNA, and a few contain bacterial DNA. **D:** Another bacterium is infected by a phage-containing bacterial DNA. **E:** The transduced bacterial DNA integrates into host DNA, and the host acquires a new trait. This host bacterium survives because no viral DNA is transduced; therefore, no viral replication can occur. (Another type of transduction mechanism is depicted in Figure 29–8.)

306. The beta lactam drugs that are structurally different than penicillins and cephalosporins but have a wide spectrum of bactericidal activity are
a) macrolides
b) tetracyclins
c) carbapenems
d) aminoglycosides
Key c

307. The drugs that act by inhibiting bacterial protein synthesis by acting on 30 S subunit are
a) cephalosporins
b) aminoglycosides
c) quinolones
d) monobactams
Key b

308. “ Grey baby “ syndrome is a specific adverse effect that can be seen with the use of
a) linezolid
b) vancomycin
c) chloramphenicol
d) clindamycin
Key c



Gray baby syndrome

- **Gray baby syndrome** (also termed **Gray** or **Grey syndrome**) is a rare but serious side effect that occurs **in newborn infants**
- **Pathophysiology**
- Due to lack of The **UDP- glucuronyl transferase enzyme** system of infants, especially premature infants, is immature and incapable of metabolizing the excessive drug load.
- Insufficient renal excretion of the unconjugated drug.

Pale or blue skin
Lethargic eyes

309. The drug whose prolonged use is most notoriously associated with the development of pseudomembranous colitis is

a) clindamycin, 3rd generation cephalosporins, sulphonamide
b) gentamicin
c) clarithromycin
d) vancomycin
Key a

310. Regarding drug resistance, mutations in DNA gyrase will affect

a) tetracyclines
b) quinolones
c) aminoglycosides
d) sulphonamides
Key b

311. Regarding bacterial vaccines, serotype replacement is a potential problem commonly seen with vaccines for

a) neisseria meningitides
b) hemophilus influenzae
c) streptococcus pneumoniae
d) salmonella typhi
Key c

Serotype replacement happens when the bacteria types (serotypes) not covered by a vaccine start to cause more infections after the vaccine removes the ones it targets.
Serotype replacement is well-documented phenomenon with pneumococcal vaccines, where non-vaccine serotypes fill the ecological niche left by vaccine-targeted serotypes.

312. Gonococcal ophthalmia neonatorum can be best prevented by the prophylactic use of

a) silver nitrate
b) gentian violet
c) mercurochrome
d) malachite green
Key a

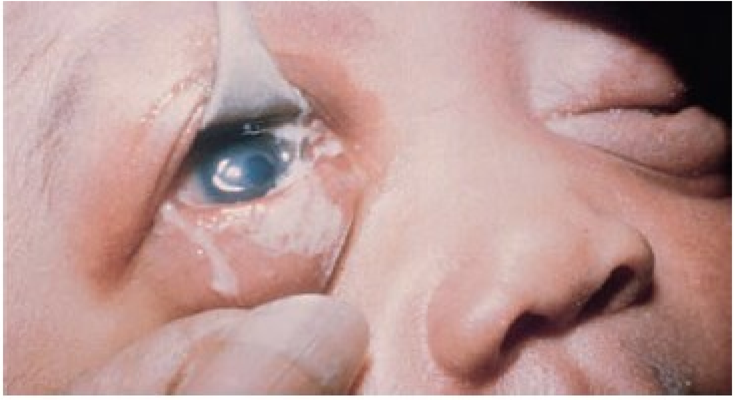
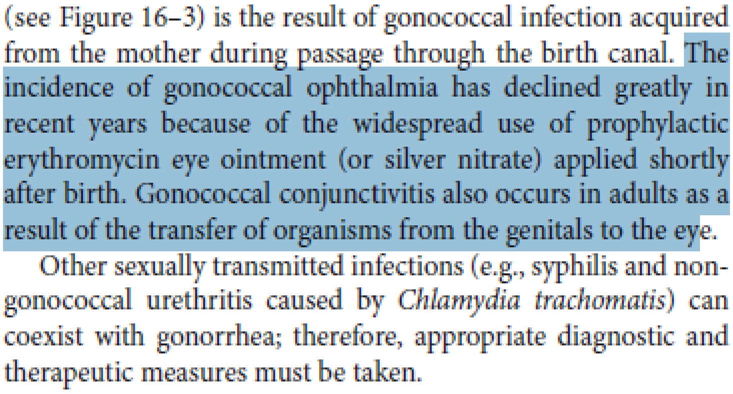


FIGURE 16–3 Neonatal conjunctivitis (ophthalmia neonatorum) caused by *Neisseria gonorrhoeae*. Note purulent exudate, especially on lower right eyelid. The other common cause of neonatal conjunctivitis is *Chlamydia trachomatis*.



(see Figure 16–3) is the result of gonococcal infection acquired from the mother during passage through the birth canal. The incidence of gonococcal ophthalmia has declined greatly in recent years because of the widespread use of prophylactic erythromycin eye ointment (or silver nitrate) applied shortly after birth. Gonococcal conjunctivitis also occurs in adults as a result of the transfer of organisms from the genitals to the eye.

Other sexually transmitted infections (e.g., syphilis and nongonococcal urethritis caused by *Chlamydia trachomatis*) can coexist with gonorrhea; therefore, appropriate diagnostic and therapeutic measures must be taken.

313. Spills on hospital floors can be disinfected by using

a) chlorhexidine
b) formaldehyde
c) hexachlorophene
d) hypochlorite
Key d

314. Disinfection of milk can be carried out by the process of

a) Autoclaving
b) Filtration

c) Pasteurization (holder’s method 62 C for 30 mins, flash pas 72 for 15 sec)
d) Radiation
Key c

315. Staphylococcus saprophyticus is an important cause of
a) Urinary tract infection
b) Infective endocarditis
c) Meningitis
d) Ventilator associated pneumonia
e) Surgical wound infections
Key a

316. Acute glomerulonephritis can occur due to a late complication of infection with
a) Staphylococcus aureus
b) Streptococcus pneumoniae
c) Streptococcus viridans
d) Streptococcus pyogenes
e) Staphylococcus epidermidis
Key d

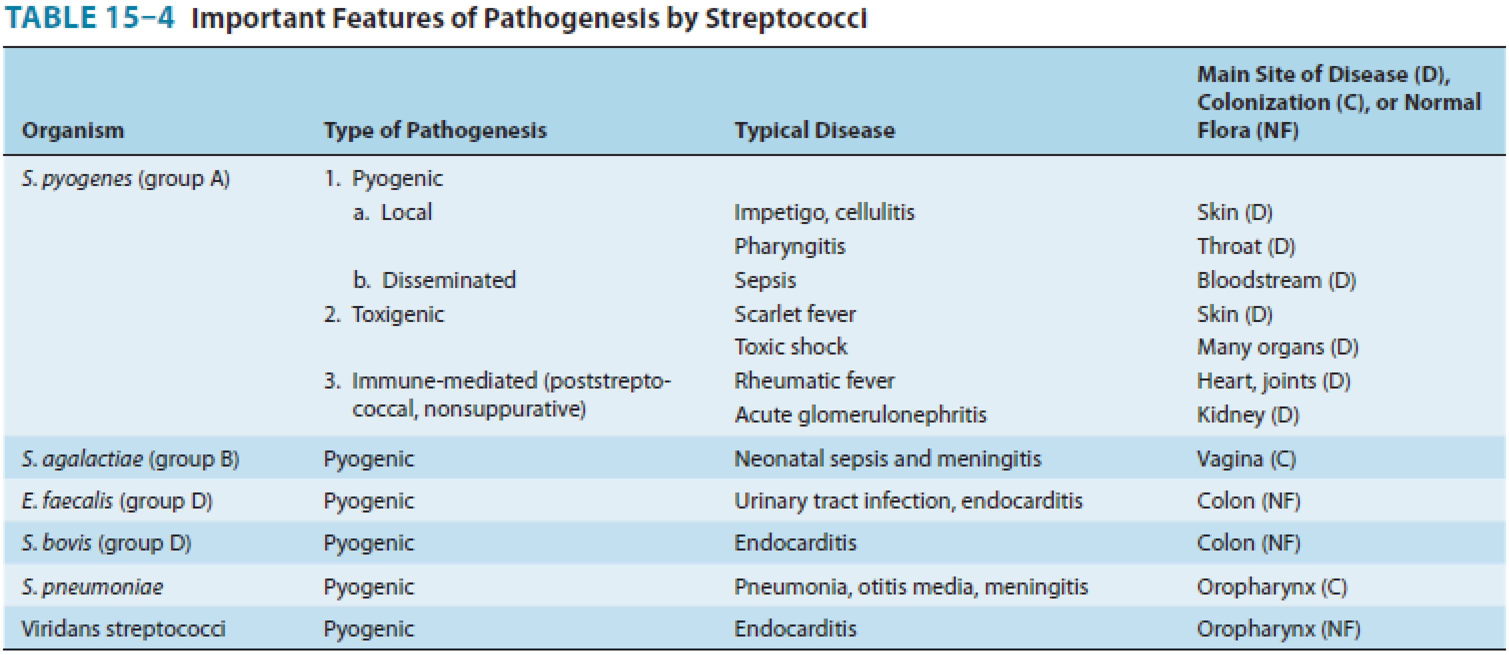


TABLE 15–4 Important Features of Pathogenesis by Streptococci

Organism	Type of Pathogenesis	Typical Disease	Main Site of Disease (D), Colonization (C), or Normal Flora (NF)
S. pyogenes (group A)	1. Pyogenic		
	a. Local	Impetigo, cellulitis	Skin (D)
		Pharyngitis	Throat (D)
	b. Disseminated	Sepsis	Bloodstream (D)
	2. Toxigenic	Scarlet fever	Skin (D)
		Toxic shock	Many organs (D)
	3. Immune-mediated (poststreptococcal, nonsuppurative)	Rheumatic fever	Heart, joints (D)
		Acute glomerulonephritis	Kidney (D)
S. agalactiae (group B)	Pyogenic	Neonatal sepsis and meningitis	Vagina (C)
E. faecalis (group D)	Pyogenic	Urinary tract infection, endocarditis	Colon (NF)
S. bovis (group D)	Pyogenic	Endocarditis	Colon (NF)
S. pneumoniae	Pyogenic	Pneumonia, otitis media, meningitis	Oropharynx (C)
Viridans streptococci	Pyogenic	Endocarditis	Oropharynx (NF)

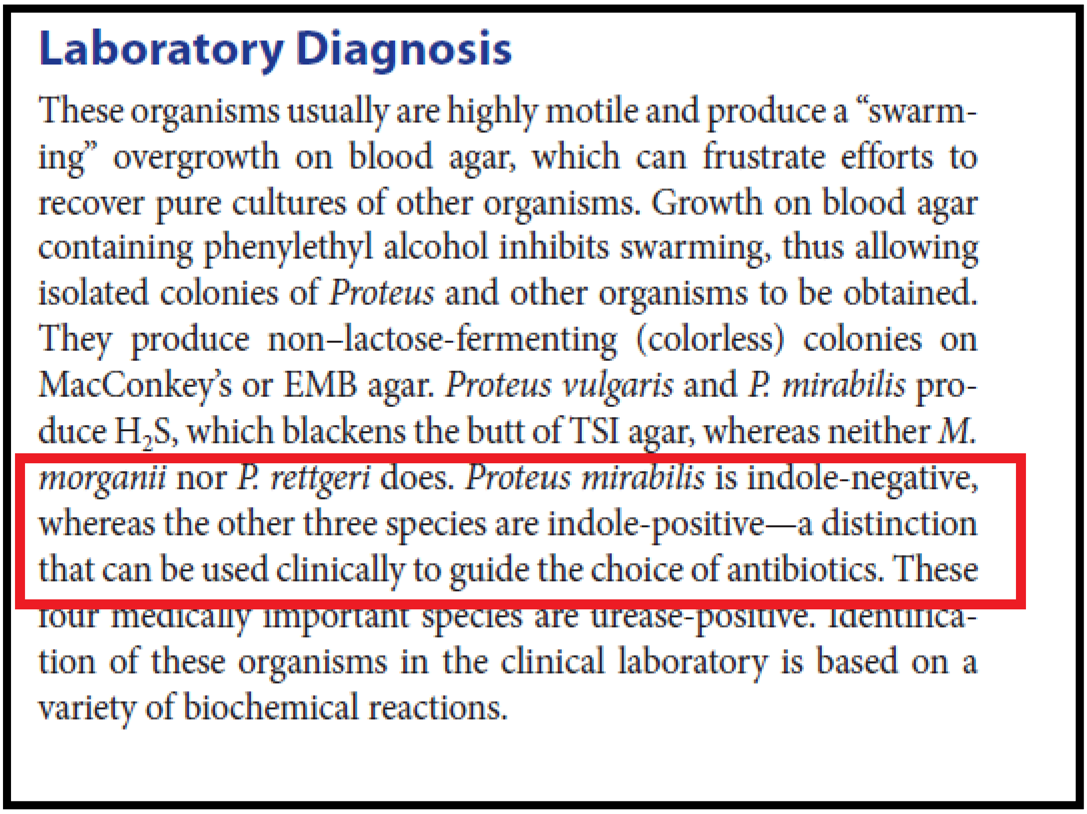
317. Vancomycin resistance is a new emerging threat seen in strains of
a) Klebsiella pneumoniae
b) Enterococcus faecium (VRE)
c) Mycobacterium tuberculosis
d) Salmonella typhi
e) Acinetobacter baumanii
Key b

318. IgA protease is an important virulence factor seen in infection with
a) Clostridium botulinum
b) Borrelia recurrentis
c) Corynebacterium diphtheriae
d) Streptococcus pyogenes
e) Neisseria meningitides
Key e

319. ‘Tennis racket’ appearance seen on gram stain is characteristic of
a) Listeria monocytogenes
b) Clostridium tetani

c) Vibrio cholerae
d) Streptococcus pneumoniae
e) Corynebacterium diphtheriae
Key b

320. Indole negative test is helpful in confirming the diagnosis of
a) Escherichia coli
b) Proteus vulgaris
c) Providencia rettgeri
d) Proteus mirabilis
e) Morganella morganii
Key d

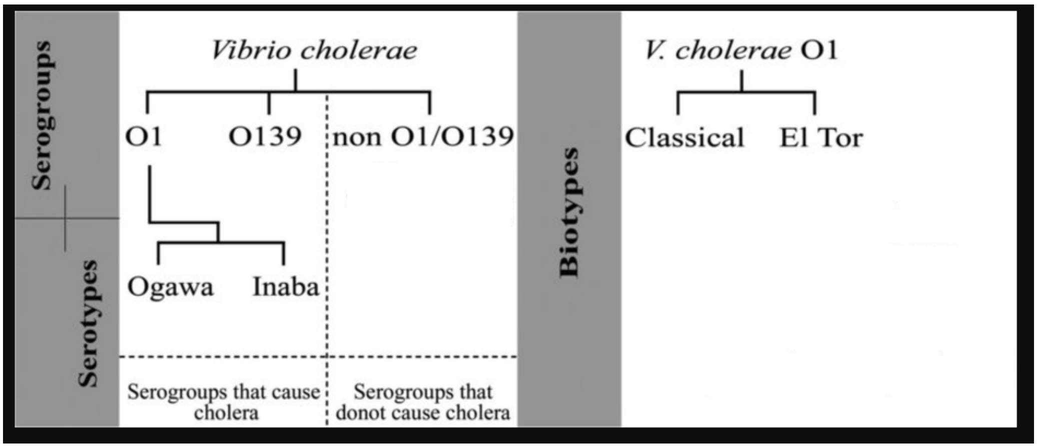


Laboratory Diagnosis

These organisms usually are highly motile and produce a "swarming" overgrowth on blood agar, which can frustrate efforts to recover pure cultures of other organisms. Growth on blood agar containing phenylethyl alcohol inhibits swarming, thus allowing isolated colonies of *Proteus* and other organisms to be obtained. They produce non–lactose-fermenting (colorless) colonies on MacConkey's or EMB agar. *Proteus vulgaris* and *P. mirabilis* produce H_2S, which blackens the butt of TSI agar, whereas neither *M. morganii* nor *P. rettgeri* does. *Proteus mirabilis* is indole-negative, whereas the other three species are indole-positive—a distinction that can be used clinically to guide the choice of antibiotics. These four medically important species are urease-positive. Identification of these organisms in the clinical laboratory is based on a variety of biochemical reactions.

321. In case of Typhoid carrier state, the organism resides inside the host's
a) Gall bladder
b) Duodenum
c) Liver
d) Colon
e) Ileum
Key a

322. 'El Tor' is the biotype of
a) Escherichia coli
b) Shigella dysenteriae
c) Vibrio cholerae
d) Salmonella typhi
e) Helicobacter pylori
Key c


Serogroups
Serotypes
Vibrio cholerae
O1
O139
non O1/O139
Ogawa
Inaba
Serogroups that cause cholera
Serogroups that donot cause cholera
Biotypes
V. cholerae O1
Classical
El Tor

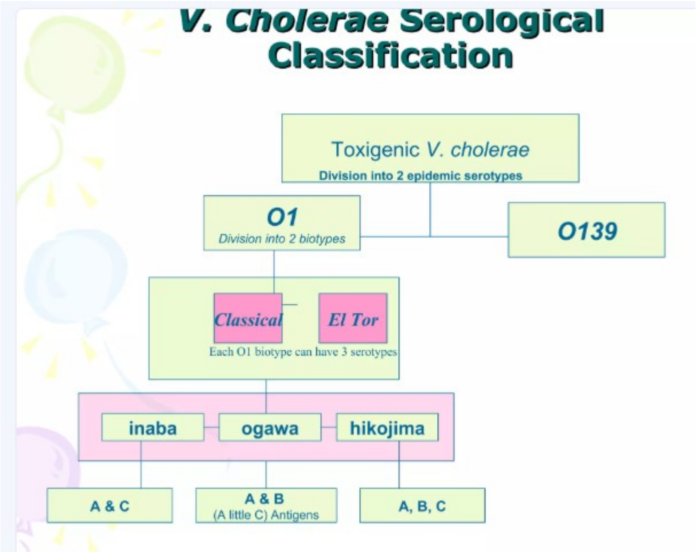
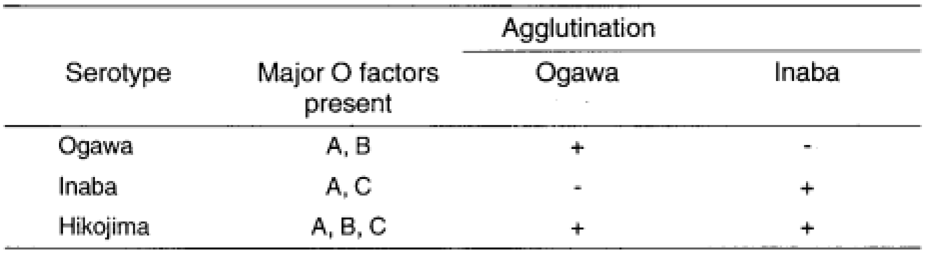

V. Cholerae Serological Classification
Toxigenic V. cholerae
Division into 2 epidemic serotypes
O1
Division into 2 biotypes
O139
Classical
El Tor
Each O1 biotype can have 3 serotypes
inaba
ogawa
hikojima
A & C
A & B
(A little C) Antigens
A, B, C

Table VI-3. Identifying characteristics of serotypes of *V. cholerae* serogroup O1

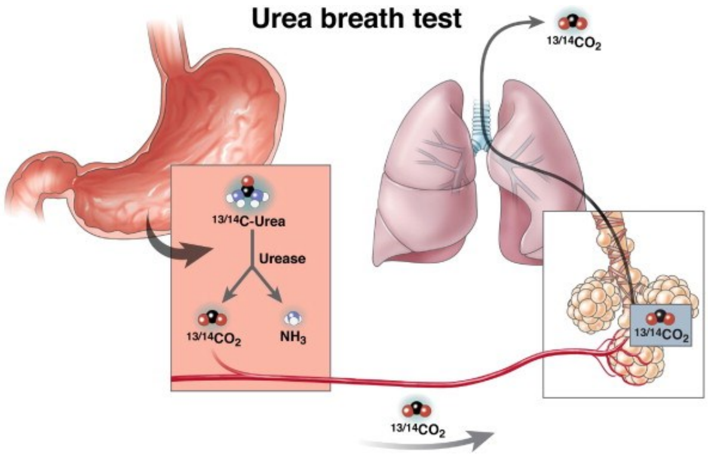


Serotype	Major O factors present	Agglutination	
		Ogawa	Inaba
Ogawa	A, B	+	-
Inaba	A, C	-	+
Hikojima	A, B, C	+	+

323. “Urea breath” test is a non-invasive test done to diagnose infection with

a) Helicobacter pylori
b) Campylobacter intestinalis
c) Legionella pneumophila
d) Mycoplasma pneumoniae
e) Proteus vulgaris

Key a

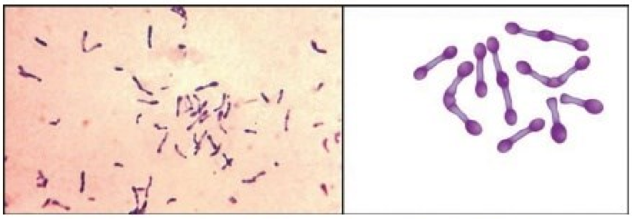


The urea breath test detects *Helicobacter pylori* infection. The patient swallows urea containing carbon isotope (C-13 or C-14). If *H. pylori* is present, its urease enzyme breaks down urea into CO2, which is exhaled and measured.

324. Metachromatic granules are seen in case of

a) Prevotella melaninogenica
b) Actinomyces israelii
c) Nocardia asteroides
d) Corynebacterium diphtheriae
e) Clostridium perfringens

Key d



(a) Gram staining of *Corynebacterium diphtheriae* showing metachromatic granules

(b) Albert's staining

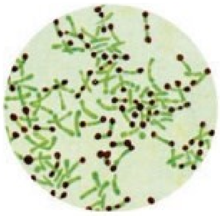


Figure 7.9:

325. ''Fluorescein"is produced by

a) Klebsiella pneumoniae
b) Mycobacterium kansasii
c) Legionella pneumophila
d) Prevotella melaninogenica
e) Pseudomonas aeruginosa

Key e

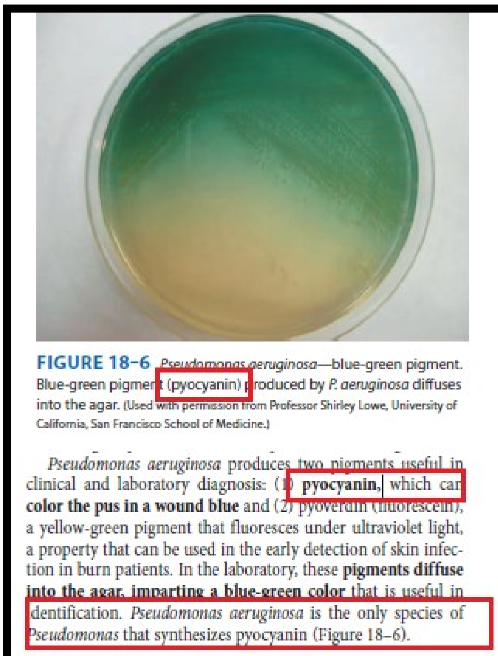
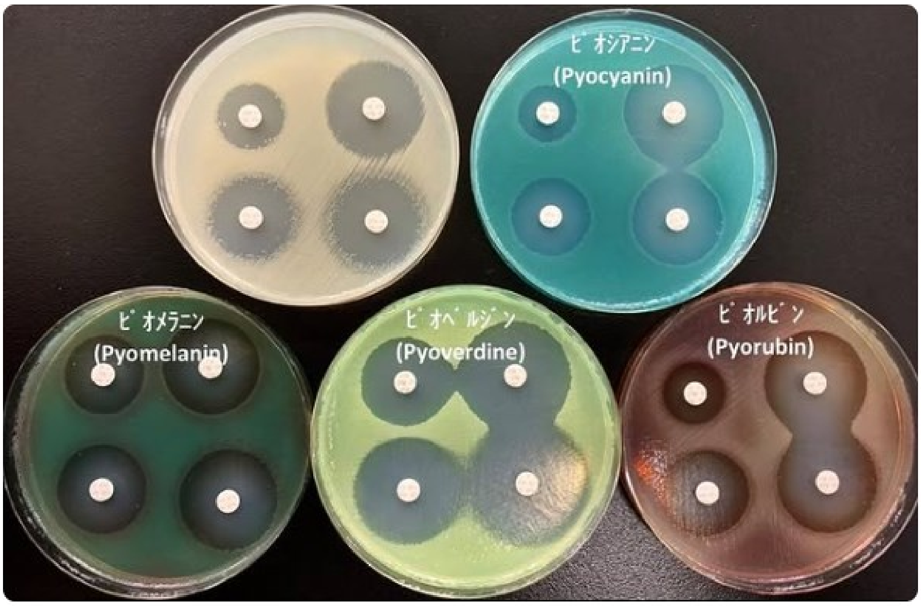
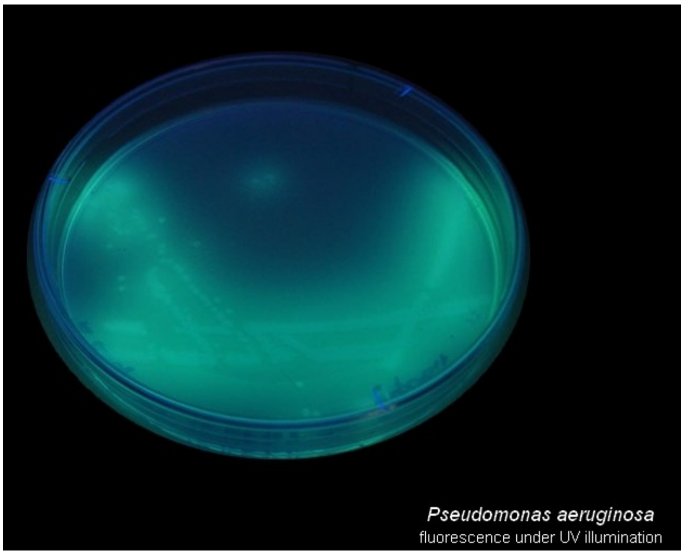


FIGURE 18–6 *Pseudomonas aeruginosa*—blue-green pigment. Blue-green pigment (pyocyanin) produced by *P. aeruginosa* diffuses into the agar. (Used with permission from Professor Shirley Lowe, University of California, San Francisco School of Medicine.)

Pseudomonas aeruginosa produces two pigments useful in clinical and laboratory diagnosis: (1) **pyocyanin,** which can **color the pus in a wound blue** and (2) pyoverdin (fluorescein), a yellow-green pigment that fluoresces under ultraviolet light, a property that can be used in the early detection of skin infection in burn patients. In the laboratory, these **pigments diffuse into the agar, imparting a blue-green color** that is useful in identification. *Pseudomonas aeruginosa* is the only species of *Pseudomonas* that synthesizes pyocyanin (Figure 18–6).





Pseudomonas aeruginosa
fluorescence under UV illumination

326. The serotype of Hemophilus influenzae most frequently involved in meningitis is

a) a
b) b
c) c
d) d
e) e

Key b

327. ‘100 days cough’ is caused

a) Mycobacterium tuberculosis
b) Streptococcus pneumoniae
c) Streptococcus pyogenes
d) Bordetella pertussis
e) Hemophilus influenzae

Key d

328. Rapid dectection of Legionella pneumophila antigen can be done on

a) Blood
b) Sputum
c) CSF
d) Urine
e) Stool

Key d

BinaxNOW™
LEGIONELLA

BinaxNOW™ Legionella Urinary Antigen Card provides accurate, rapid identification of Legionnaires' disease caused by Legionella pneumophila serogroup 1 with an easy-to-use technology. Rapid diagnosis of Legionnaires' disease and early initiation of appropriate therapy has been shown to dramatically reduce morbidity and mortality. The BinaxNOW™ Legionella Urinary Antigen Card can be read visually or with the DIGIVAL™ which eliminates operator subjectivity and is designed to provide consistency in the reading of lateral flow test assays.

329. The animal reservoir of Brucella melitensis is

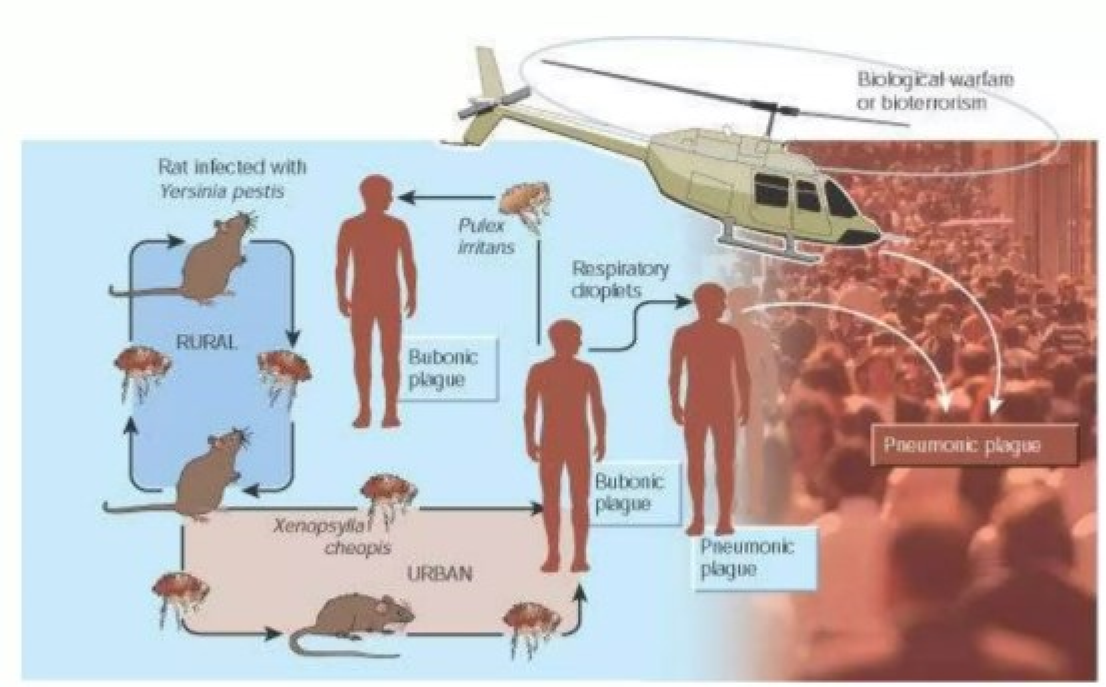
a) Cattle
b) Pigs
c) Dogs
d) Cats
e) Goats

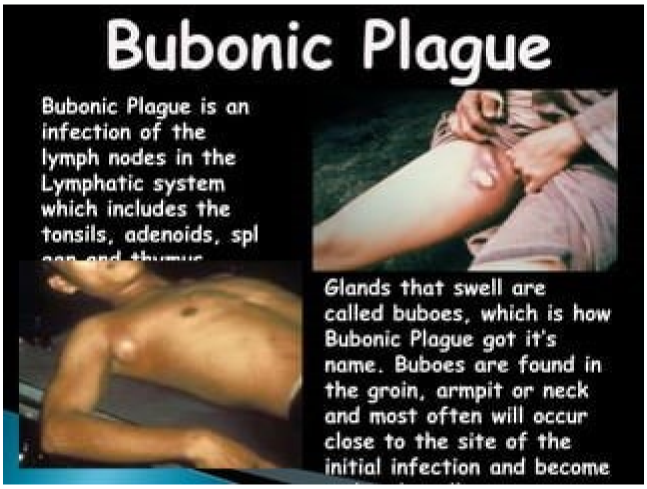
Key e

330. Buboes (enlarged lymph nodes) are found in infection with

a) Yersinia pestis
b) Mycobacterium tuberculosis
c) Hemophilis Ducreyi
d) Treponema pallidum
e) Bartonella henselae

Key a


Biological warfare or bioterrorism
Rat infected with Yersinia pestis
Pulex irritans
RURAL
Bubonic plague
Respiratory droplets
Bubonic plague
Pneumonic plague
Pneumonic plague
Xenopsylla cheopis
URBAN



Bubonic Plague

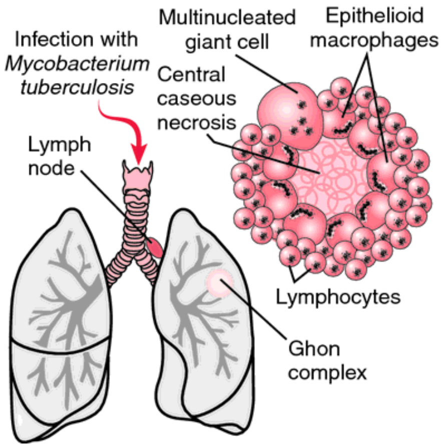
Bubonic Plague is an infection of the lymph nodes in the Lymphatic system which includes the tonsils, adenoids, spl

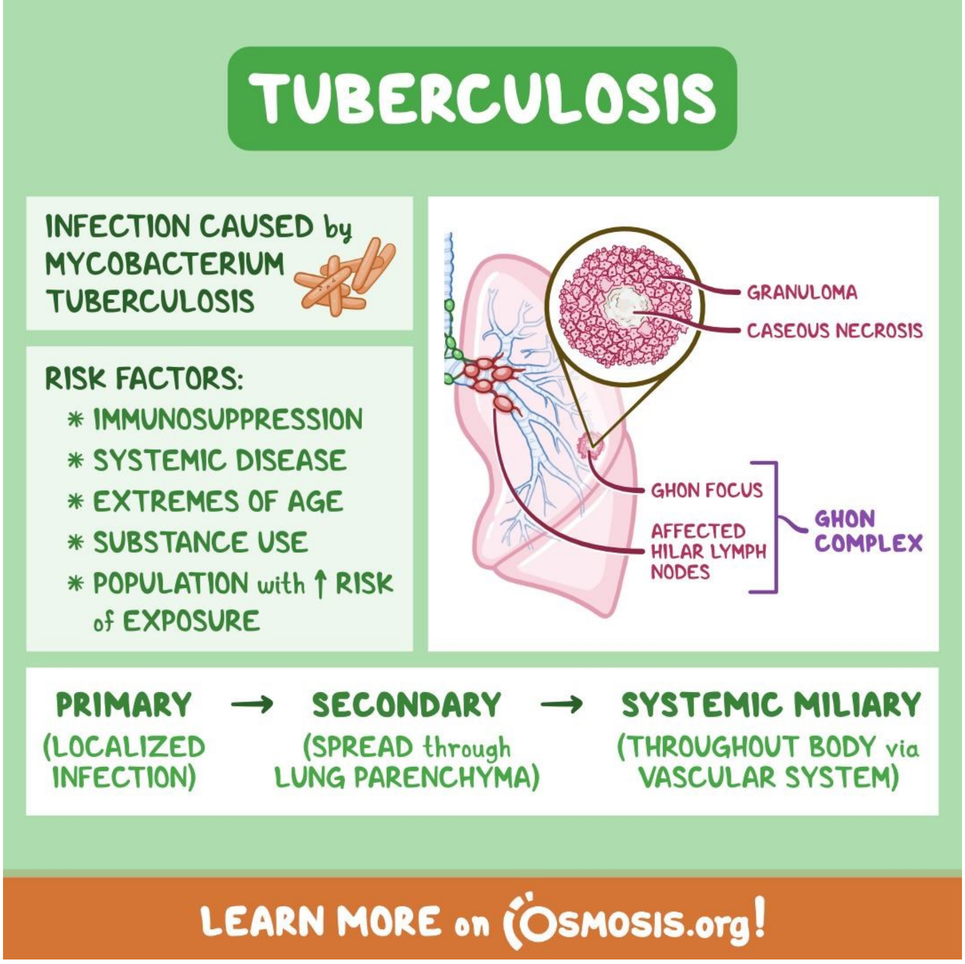
Glands that swell are called buboes, which is how Bubonic Plague got it's name. Buboes are found in the groin, armpit or neck and most often will occur close to the site of the initial infection and become

331. ‘Ghon focus’ is the primary lesion seen in infection with

a) Streptococcus pneumoniae
b) Hemophilus influenzae
c) Mycobacterium tuberculosis
d) Neisseria meningitides
e) Actinomyces israelii

Key c


Infection with *Mycobacterium tuberculosis*
Multinucleated giant cell
Epithelioid macrophages
Central caseous necrosis
Lymph node
Lymphocytes
Ghon complex



TUBERCULOSIS

INFECTION CAUSED by MYCOBACTERIUM TUBERCULOSIS

RISK FACTORS:
- IMMUNOSUPPRESSION
- SYSTEMIC DISEASE
- EXTREMES OF AGE
- SUBSTANCE USE
- POPULATION with ↑ RISK of EXPOSURE

GRANULOMA
CASEOUS NECROSIS
GHON FOCUS
AFFECTED HILAR LYMPH NODES
GHON COMPLEX

PRIMARY (LOCALIZED INFECTION) → SECONDARY (SPREAD through LUNG PARENCHYMA) → SYSTEMIC MILIARY (THROUGHOUT BODY via VASCULAR SYSTEM)

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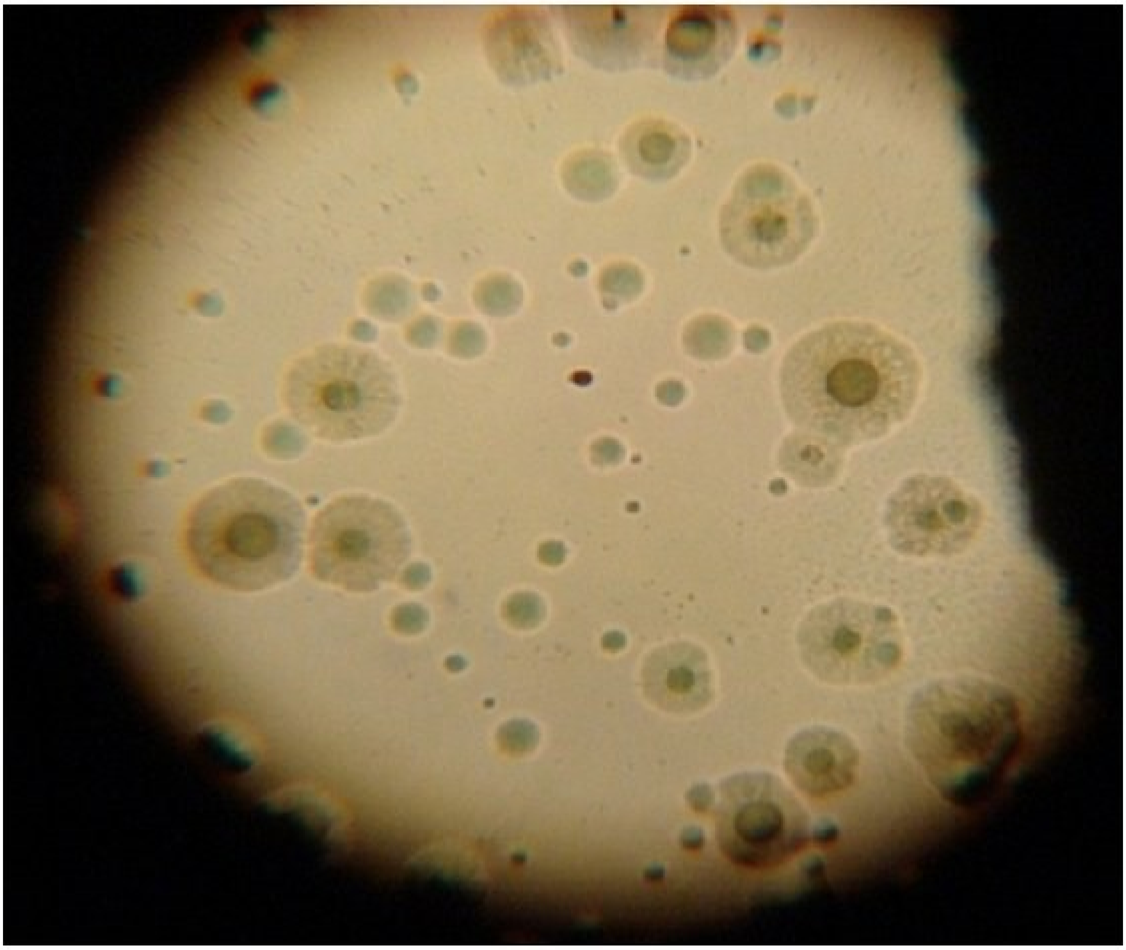
332. Nocardia asteroides is most frequently involved in the pathogenesis of --------------abscess.
- a) Splenic
- b) Cerebral
- c) Ovarian
- d) Liver
- e) Testicular

Key b

333. ‘Fried egg’ shaped colonies are seen in case of
- a) Listeria monocytogenes
- b) Streptococcus pneumoniae
- c) Legionella pneumophila
- d) Neisseria meningitides
- e) Mycoplasma pneumoniae

Key e



334. Condyloma Lata are seen in infection caused by

a) Chlamydia trachomatis
b) Treponema pallidum
c) Haemophilus Ducreyi
d) Neisseria gonorrhoea
e) Gardenerella vaginalis

Key b

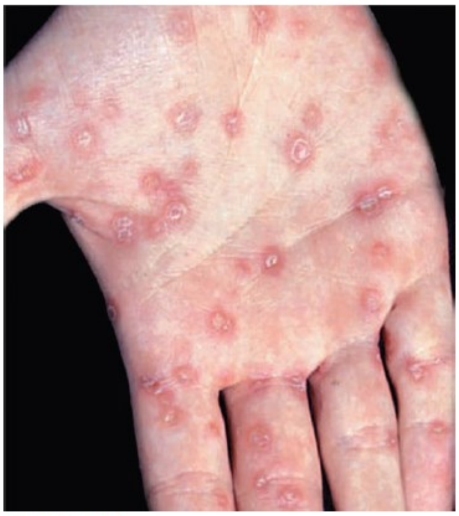


FIGURE 24–3 Palmar lesions of secondary syphilis. Note the papulosquamous lesions on the right palm. Palmar lesions are typically bilateral. (Reproduced with permission from Wolff K, Johnson R, eds. *Fitzpatrick's Color Atlas & Synopsis of Clinical Dermatology*. 6th ed. New York, NY: McGraw-Hill; 2009.)

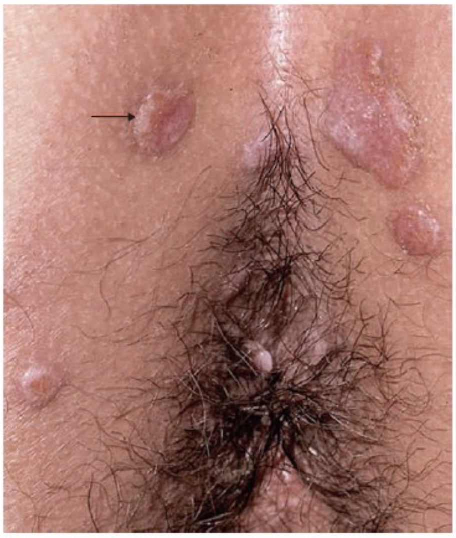
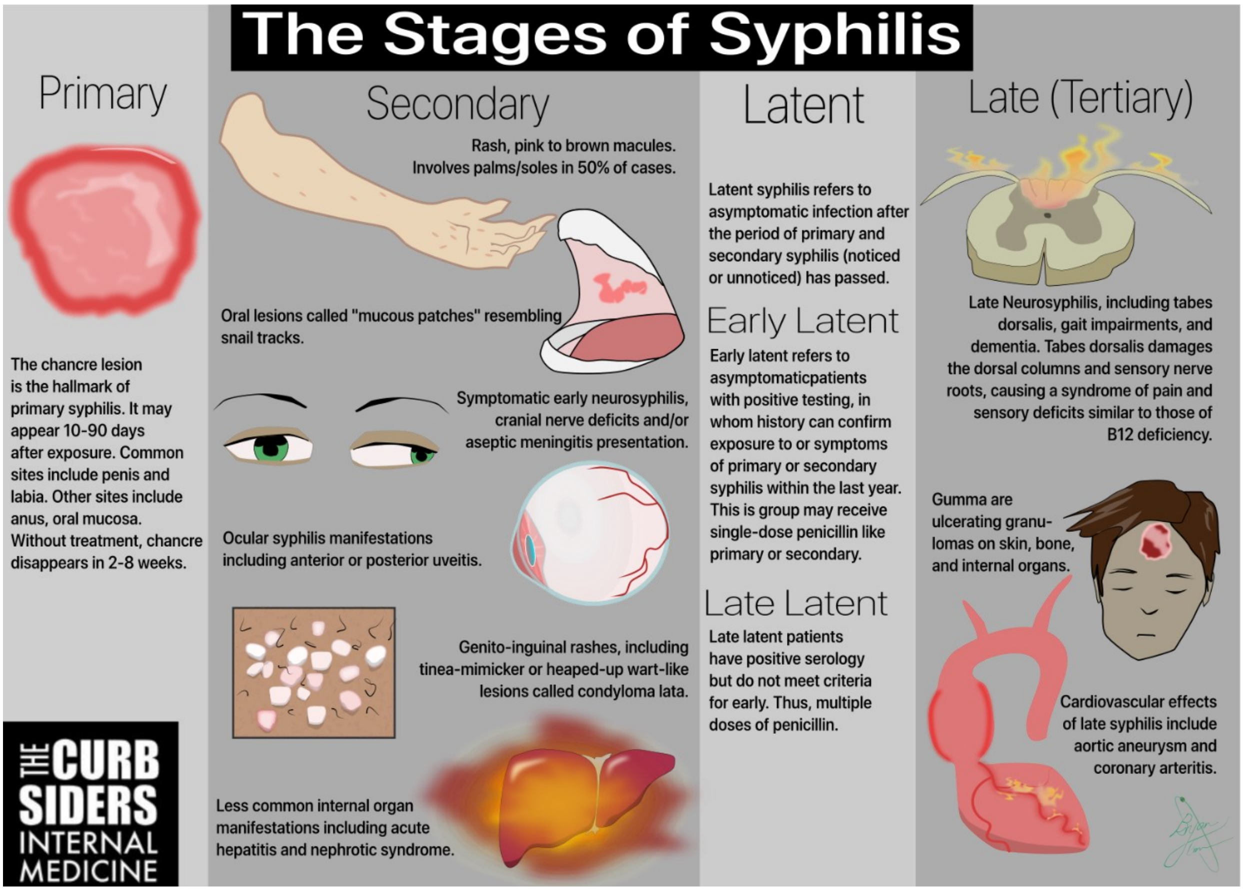


FIGURE 24–4 Condylomata lata of secondary syphilis. Note the flat, moist perianal lesions (black arrow). (Reproduced with permission from Wolff K, Johnson R, eds. *Fitzpatrick's Color Atlas & Synopsis of Clinical Dermatology*. 6th ed. New York, NY: McGraw-Hill; 2009.)



The Stages of Syphilis

Primary

The chancre lesion is the hallmark of primary syphilis. It may appear 10-90 days after exposure. Common sites include penis and labia. Other sites include anus, oral mucosa. Without treatment, chancre disappears in 2-8 weeks.

Secondary

Rash, pink to brown macules. Involves palms/soles in 50% of cases.

Oral lesions called "mucous patches" resembling snail tracks.

Symptomatic early neurosyphilis, cranial nerve deficits and/or aseptic meningitis presentation.

Ocular syphilis manifestations including anterior or posterior uveitis.

Genito-inguinal rashes, including tinea-mimicker or heaped-up wart-like lesions called condyloma lata.

Less common internal organ manifestations including acute hepatitis and nephrotic syndrome.

Latent

Latent syphilis refers to asymptomatic infection after the period of primary and secondary syphilis (noticed or unnoticed) has passed.

Early Latent

Early latent refers to asymptomaticpatients with positive testing, in whom history can confirm exposure to or symptoms of primary or secondary syphilis within the last year. This is group may receive single-dose penicillin like primary or secondary.

Late Latent

Late latent patients have positive serology but do not meet criteria for early. Thus, multiple doses of penicillin.

Late (Tertiary)

Late Neurosyphilis, including tabes dorsalis, gait impairments, and dementia. Tabes dorsalis damages the dorsal columns and sensory nerve roots, causing a syndrome of pain and sensory deficits similar to those of B12 deficiency.

Gumma are ulcerating granulomas on skin, bone, and internal organs.

Cardiovascular effects of late syphilis include aortic aneurysm and coronary arteritis.

THE CURBSIDERS INTERNAL MEDICINE

335. Borrelia burgdoferi is transmitted by the bite of infected

a) Louse
b) Mosquito
c) Ticks
d) Flea
e) Sand fly
Key c

336. ‘Inclusion bodies’ seen within cytoplasm in a Giemsa stained tissue specimen is an important diagnostic criterion for

a) Bartonella henselae
b) Treponema pallidum
c) Brucella Abortus
d) Chlamydia trachomatis
e) Mycobacterium leprae

Key d

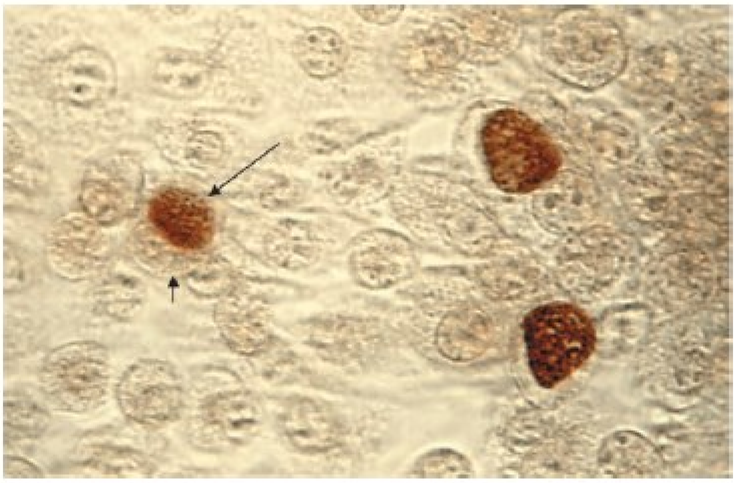


FIGURE 25–2 *Chlamydia trachomatis*—light microscopy of cell culture. Long arrow points to cytoplasmic inclusion body of *C. trachomatis*; short arrow points to nucleus of cell. (Source: Dr. E. Arum and Dr. N. Jacobs, Public Health Image Library, Centers for Disease Control and Prevention.)

337. Rocky mountain spotted fever is caused by Rickettsia

a) Prowazeckii
b) Akari
c) Tsutsugamushi
d) Typhi
e) Rickettsi
Key e

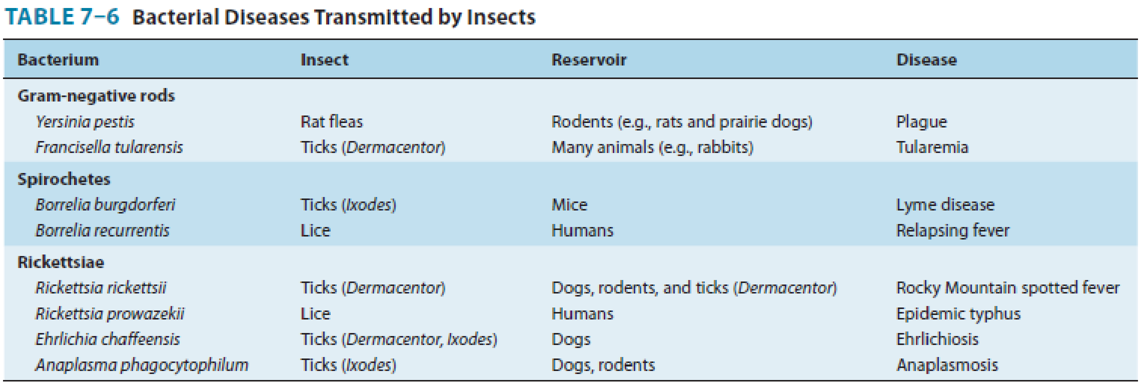
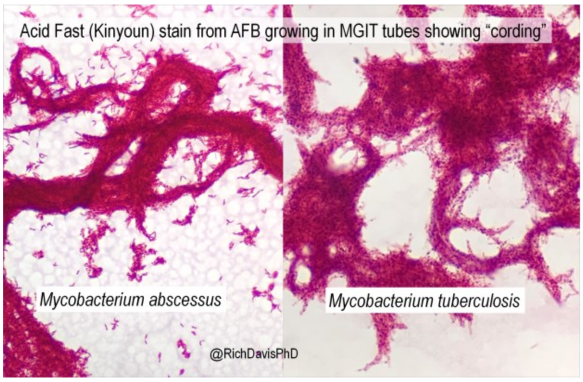


TABLE 7–6 Bacterial Diseases Transmitted by Insects

Bacterium	Insect	Reservoir	Disease
Gram-negative rods			
Yersinia pestis	Rat fleas	Rodents (e.g., rats and prairie dogs)	Plague
Francisella tularensis	Ticks (*Dermacentor*)	Many animals (e.g., rabbits)	Tularemia
Spirochetes			
Borrelia burgdorferi	Ticks (*Ixodes*)	Mice	Lyme disease
Borrelia recurrentis	Lice	Humans	Relapsing fever
Rickettsiae			
Rickettsia rickettsii	Ticks (*Dermacentor*)	Dogs, rodents, and ticks (*Dermacentor*)	Rocky Mountain spotted fever
Rickettsia prowazekii	Lice	Humans	Epidemic typhus
Ehrlichia chaffeensis	Ticks (*Dermacentor, Ixodes*)	Dogs	Ehrlichiosis
Anaplasma phagocytophilum	Ticks (*Ixodes*)	Dogs, rodents	Anaplasmosis

338. Cord factor is a virulence factor seen in strains of

a) Corynebacterium diphtheriae
b) Treponema pallidum
c) Bacillus anthracis
d) Mycobacterium tuberculosis
e) Clostridium perfringens
Key d


Acid Fast (Kinyoun) stain from AFB growing in MGIT tubes showing "cording"
Mycobacterium abscessus
Mycobacterium tuberculosis
@RichDavisPhD

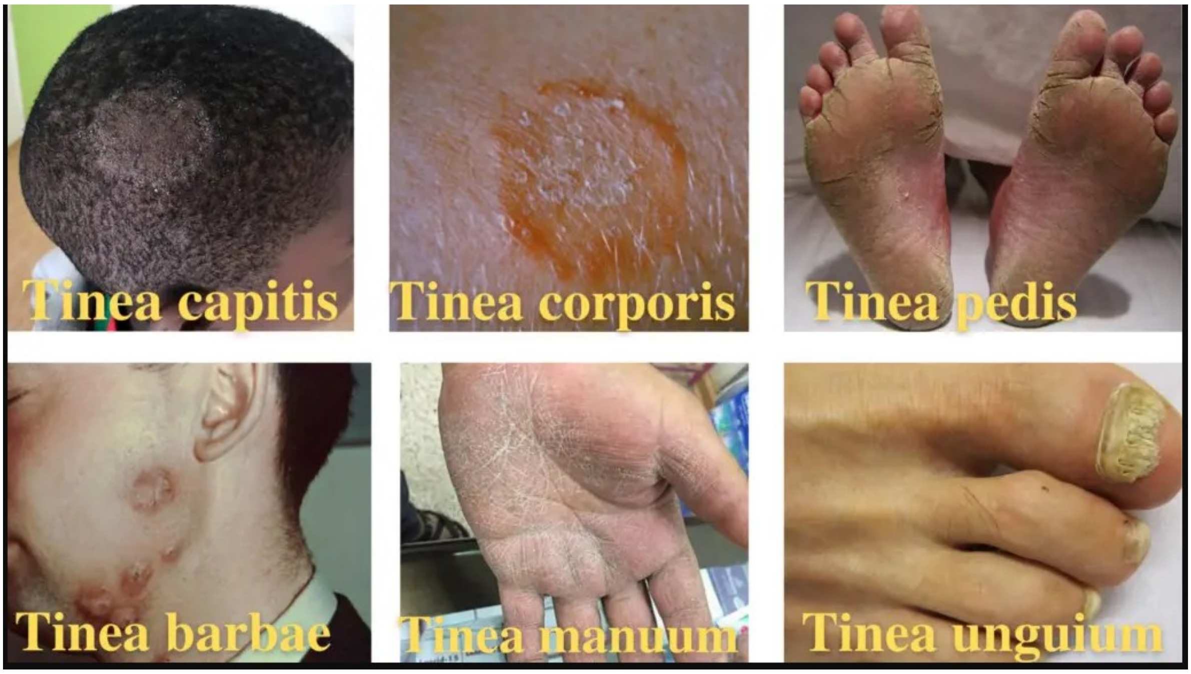
Cord factor, also known as trehalose dimycolate (TDM), is a waxy lipid found in the cell wall of Mycobacterium tuberculosis (MTB)

339. Aflatoxin B1 which can cause hepatocellular carcinoma is produced by Aspergillus

a) Terreus
b) Fumigatus
c) Rubrum
d) Flavus
e) Niger
Key d

340. Athlete's foot caused by Dermatophytes is also called Tinea

a) capitis
b) pedis
c) mannus
d) corporis
e) cruris
Key b

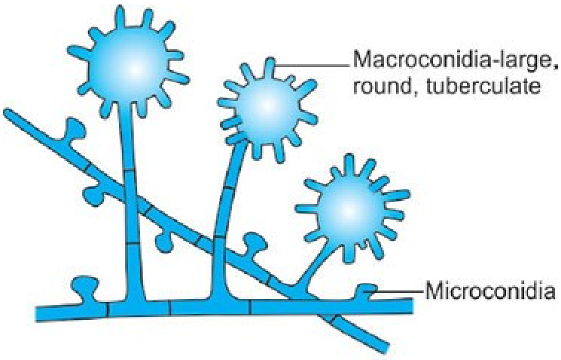

Tinea capitis
Tinea corporis
Tinea pedis
Tinea barbae
Tinea manuum
Tinea unguium

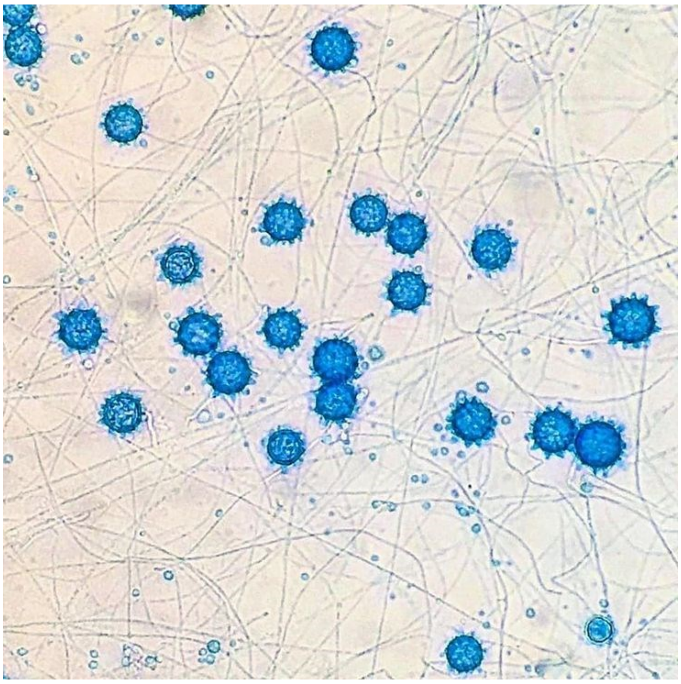
341. Malassezia furfur is the causative agent of

a) Tinea nigra
b) Chromomycosis
c) Tinea versicolor
d) Mycetoma
e) Rose gardener's disease
Key c

342. Tuberculate macroconidia are important finding seen on microscopy in the lab identification of

a) Trichophyton tonsurans
b) Paracoccidioides braziliensis
c) Aspergillus flavus
d) Histoplasma capsulatum
e) Coccidioides immitis
Key D corrected (micro ppl) HISTOPLASMA HAS TUBERCULATE MACRO

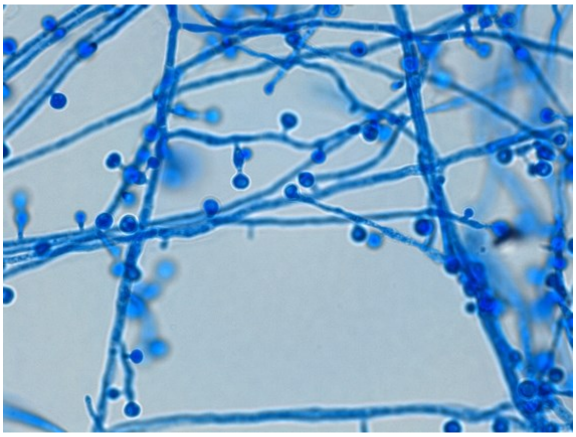

Macroconidia-large, round, tuberculate
Microconidia

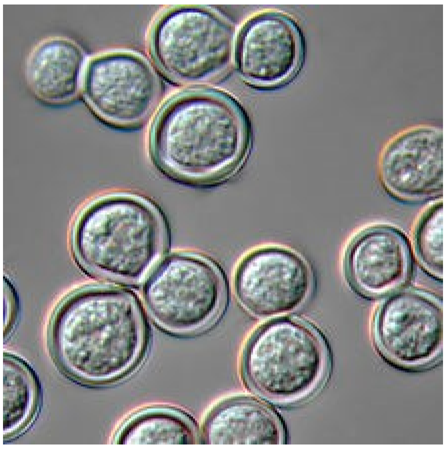


343. If a round yeast having a double refactive wall and a single broad-based bud is seen in tissue sample, the most likely diagnosis is

a) Blastomyces Dermatidis
b) Malassezia furfur
c) Candida Albicans
d) Cryptococcus neoformans
e) Paracoccidiodes braziliensis

Key a (MICRO PPL)





344. Germ tube test is positive in case of

a) Pneumocystis jirovecii
b) Histoplasma capsulatum
c) Candida albicans
d) Cryptococcus neoformans
e) Aspergillus fumigatus

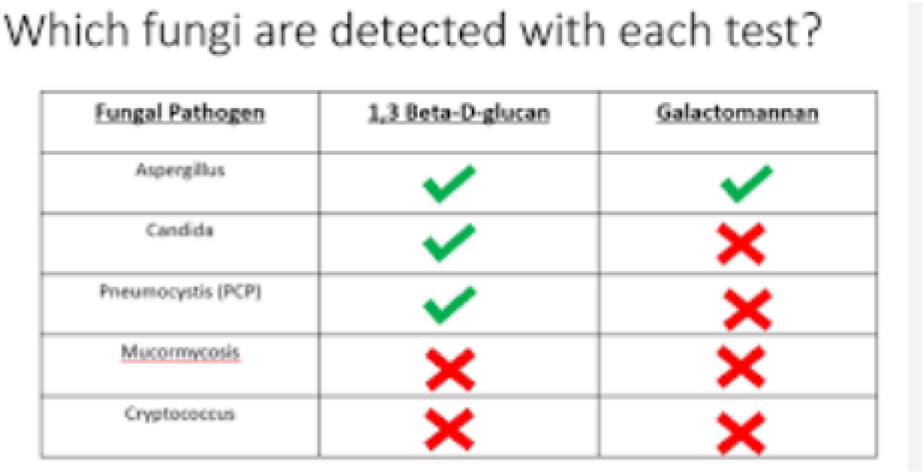
Key c

345. The mode of transmission of Cryptococcus neoformans is inhalation of

a) Conidia in dried bat droppings
b) Conidia in dried pig droppings
c) Spores in dried starling droppings

d) Spores in dried pigeon droppings
Key d

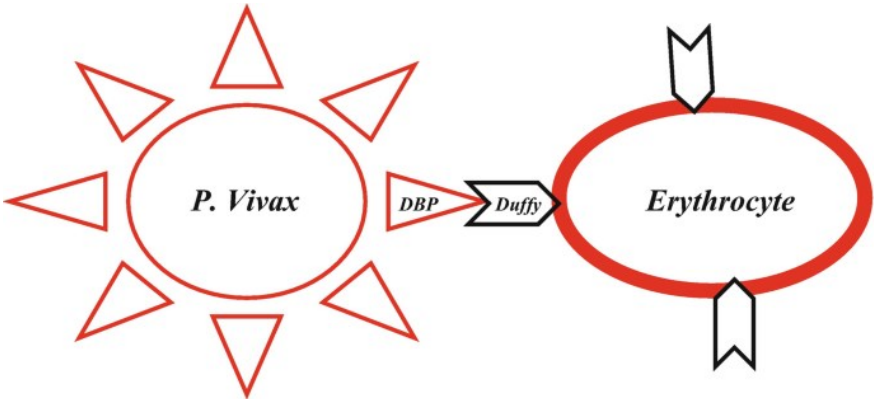
346. Invasive aspergillosis can be detected by measuring serum levels of
a) Aflatoxin B1
b) Galactomanann
c) Murein
d) Mycolic acid
e) N- acetyl muramic acid
Key b



Which fungi are detected with each test?

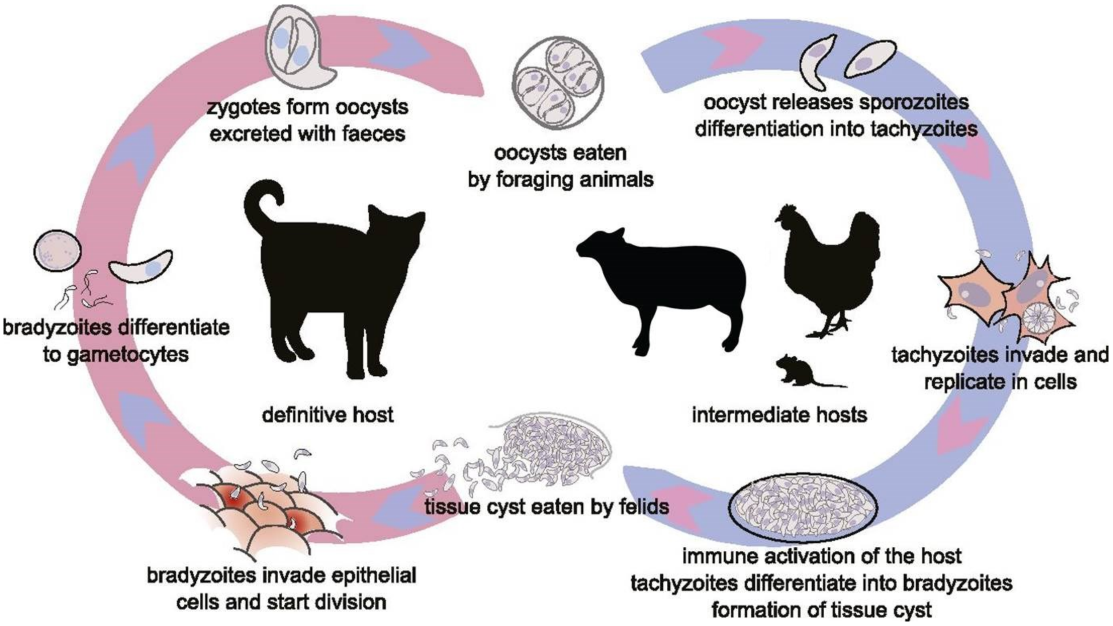
Fungal Pathogen	1,3 Beta-D-glucan	Galactomannan
Aspergillus	✓	✓
Candida	✓	✗
Pneumocystis (PCP)	✓	✗
Mucormycosis	✗	✗
Cryptococcus	✗	✗

347. People who are homozygous recessive for genes that encode Duffy blood antigen are resistant to
a) Malariae
b) Ovale
c) Vivax
d) Falciparum
e) Lavernae
Key c



The Duffy blood group antigen serves as a receptor for *Plasmodium vivax* merozoites to invade red blood cells. Individuals who are homozygous recessive for the genes encoding the Duffy antigen (Duffy-negative phenotype) lack this antigen on the surface of their red blood cells. Consequently, they are resistant to infection by *Plasmodium vivax*. This is particularly common in people of African descent, where the Duffy-negative phenotype is highly prevalent, conferring a selective advantage against *P. vivax* malaria.

348. Tachyzoites and bradyzoites are developmental stages seen in the life cycle of
a) Toxoplasma gondii
b) Leshmania donovani
c) Babesia microti
d) Plasmodium vivax
e) Trypanasoma cruzi
Key a

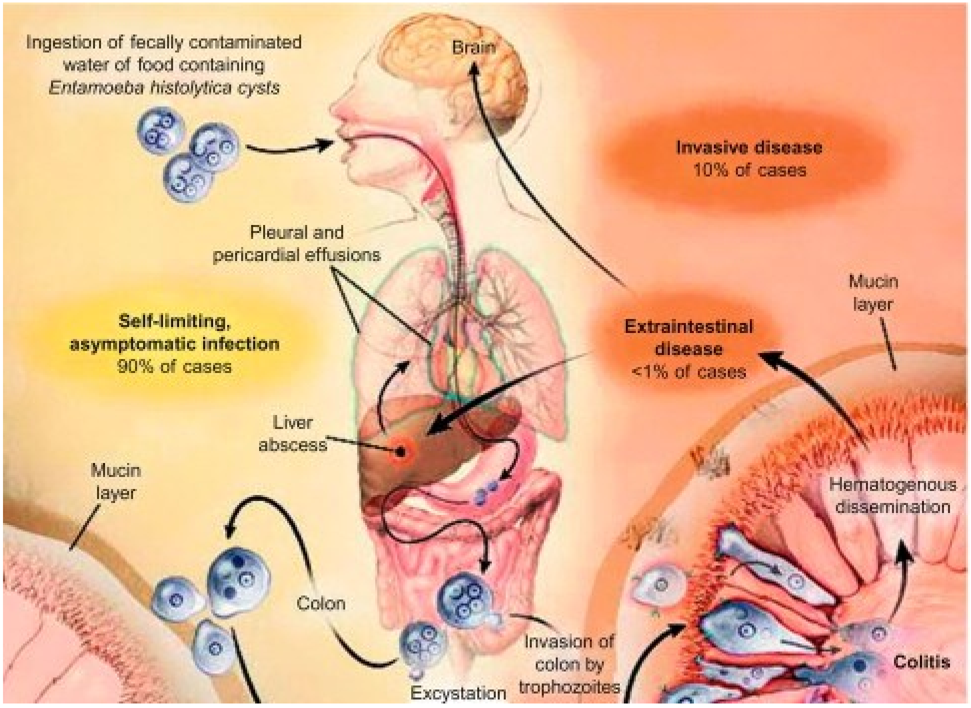

zygotes form oocysts excreted with faeces
oocysts eaten by foraging animals
oocyst releases sporozoites differentiation into tachyzoites
bradyzoites differentiate to gametocytes
definitive host
intermediate hosts
tachyzoites invade and replicate in cells
tissue cyst eaten by felids
bradyzoites invade epithelial cells and start division
immune activation of the host tachyzoites differentiate into bradyzoites formation of tissue cyst

In *Toxoplasma gondii*, tachyzoites are the rapidly multiplying, invasive forms found during the acute phase of infection, while bradyzoites are the slowly dividing, dormant forms encysted in tissues during the chronic phase.

349. If liver abscess aspirate reveals brownish yellow pus with consistency of ‘‘anchovy paste sauce’’’it is most likely caused by

a) Onchocerca volvulus
b) Clonerchis sinensis
c) Entamoeba histolytica
d) Giardia lamblia
e) Echinococcus granulosus

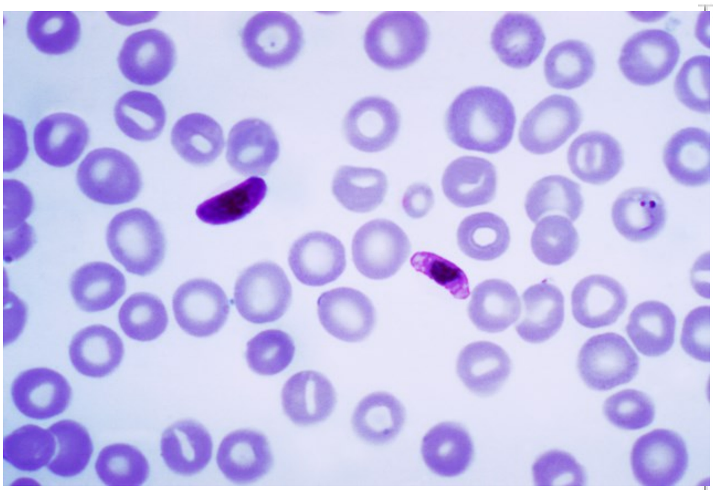
Key c


Ingestion of fecally contaminated water of food containing *Entamoeba histolytica cysts*
Brain
Invasive disease
10% of cases
Pleural and pericardial effusions
Self-limiting, asymptomatic infection
90% of cases
Extraintestinal disease
<1% of cases
Mucin layer
Liver abscess
Mucin layer
Hematogenous dissemination
Colon
Excystation
Invasion of colon by trophozoites
Colitis

2
SAMPLE CONTAINER 50ML
LIVER ABSCESS
REVOMAX, Customer Care No.: 9393013200
BOROSILICATE GLASS TEST TUBE

350. 'Çrescent-shaped' gametocytes within host RBCs are seen in case of infection with Plasmodium

a) Malariae
b) Falciparum
c) Lavernae
d) Ovale
e) Vivax
Key b



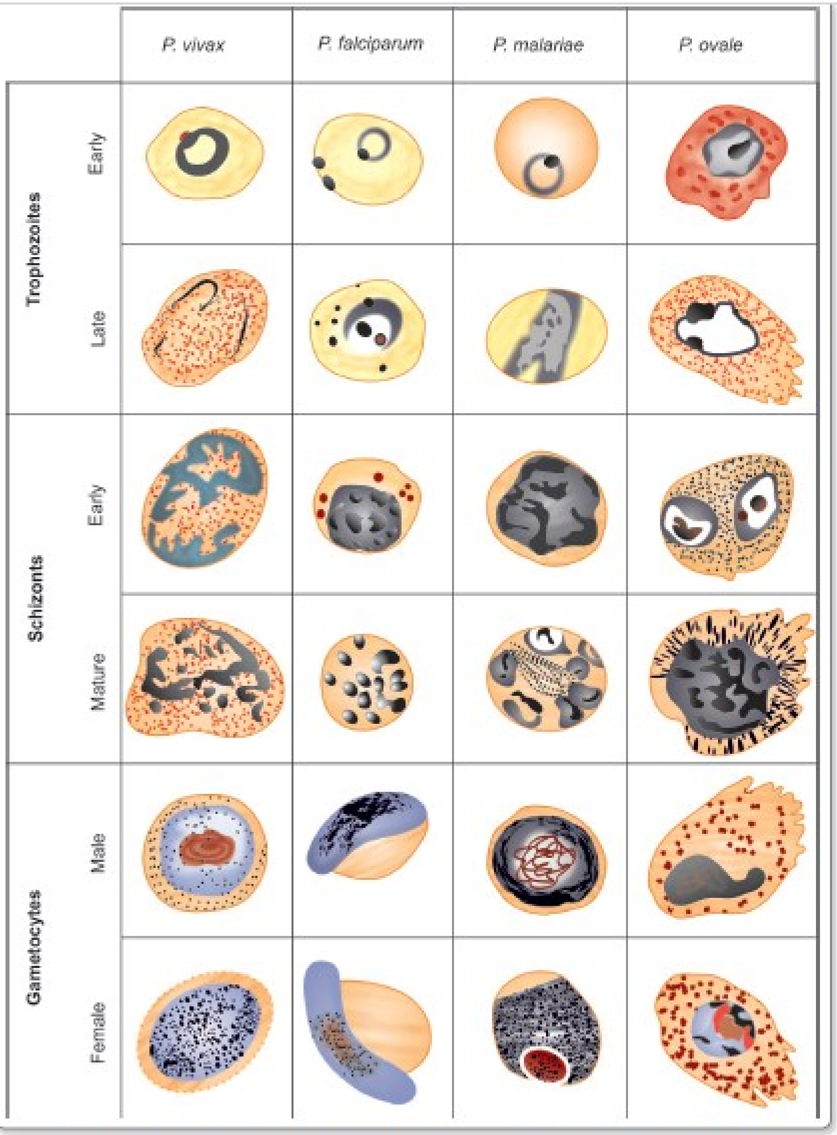
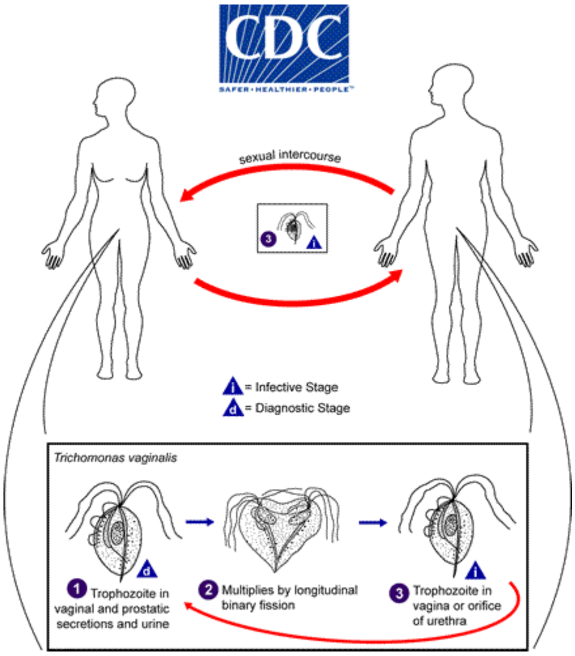

P. vivax
P. falciparum
P. malariae
P. ovale
Trophozoites
Early
Late
Schizonts
Early
Mature
Gametocytes
Male
Female

Fig. 6.3: Malaria parasites—Erythrocytic stages of the four species (Giemsa stain. Magn × 2000)

351. The mode of transmission of Trichomonas vaginalis is

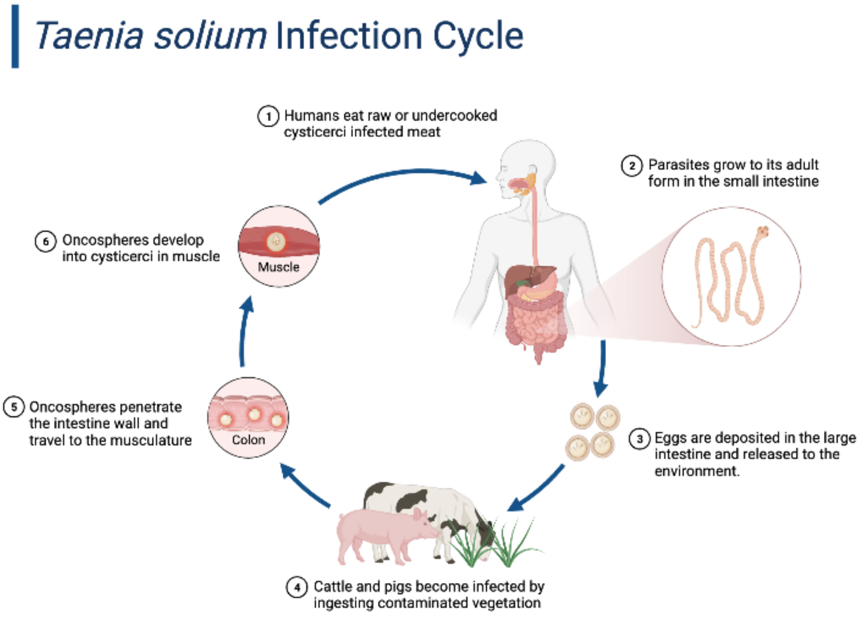
a) Inhalation of spores in cat litter
b) Bite of infected female tick
c) Transfusion of infected blood products
d) Feco-oral route
e) Unprotected sexual intercourse
Key e


CDC
SAFER·HEALTHIER·PEOPLE
sexual intercourse
3
i
i = Infective Stage
d = Diagnostic Stage
Trichomonas vaginalis
d
1 Trophozoite in vaginal and prostatic secretions and urine
2 Multiplies by longitudinal binary fission
i
3 Trophozoite in vagina or orifice of urethra

PEAR SHAPED TROPHOZOITE
TWITCHING / JERKY MOTILITY

352. The intermediate host of Taenia solium is

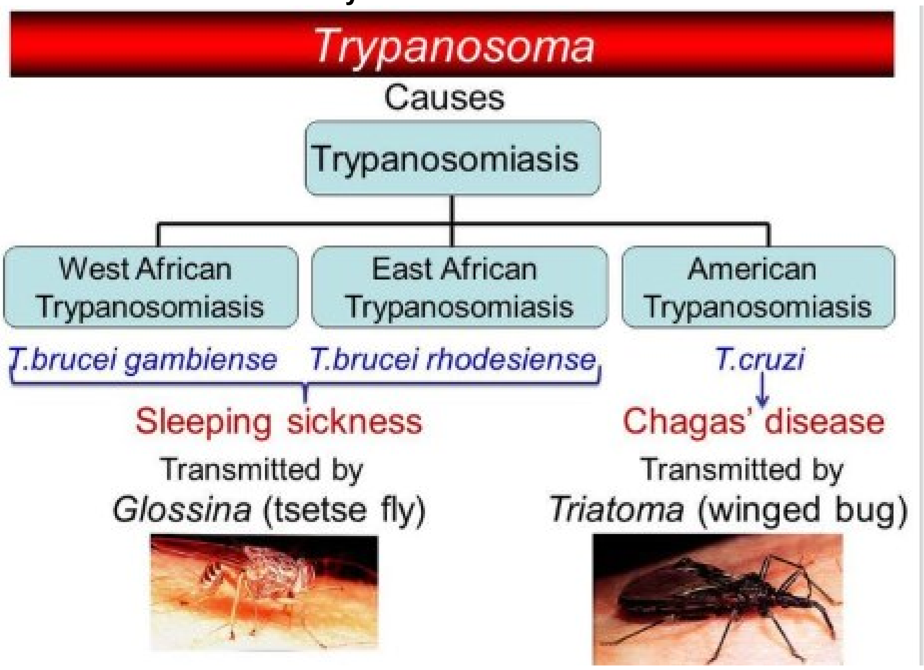
a) Human
b) Fish
c) Cattle
d) Pig
e) Dog
Key d


Taenia solium Infection Cycle
① Humans eat raw or undercooked cysticerci infected meat
② Parasites grow to its adult form in the small intestine
③ Eggs are deposited in the large intestine and released to the environment.
④ Cattle and pigs become infected by ingesting contaminated vegetation
⑤ Oncospheres penetrate the intestine wall and travel to the musculature
Colon
⑥ Oncospheres develop into cysticerci in muscle
Muscle

353. Sleeping sickness is caused by

a) Trypanasoma brucei
b) Naegleria fowleri
c) Cryptococcus neoformans
d) Babesia microti
e) Toxoplasma gondii

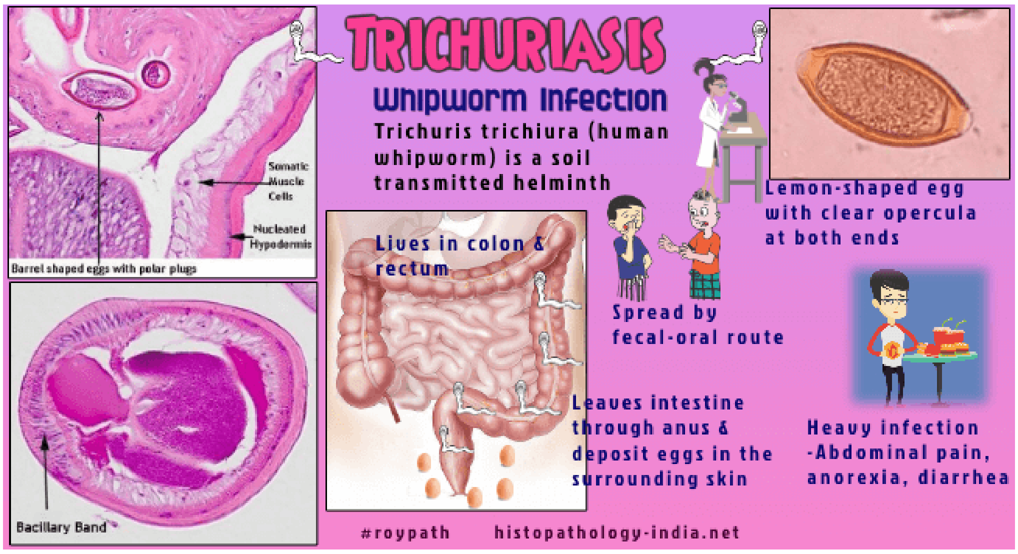
Key a


Trypanosoma
Causes
Trypanosomiasis
West African Trypanosomiasis
East African Trypanosomiasis
American Trypanosomiasis
T.brucei gambiense
T.brucei rhodesiense
T.cruzi
Sleeping sickness
Transmitted by
Glossina (tsetse fly)
Chagas' disease
Transmitted by
Triatoma (winged bug)

354. Rectal prolapse in children can occur as a result of heavy infection with

a) Trichuris trichura
b) Strongyloides stercoralis
c) Ascaris lumbricoides
d) Trichinella spiralis
e) Entrobius vermicularis

Key a


TRICHURIASIS
Whipworm Infection
Somatic Muscle Cells
Nucleated Hypodermis
Barrel shaped eggs with polar plugs
Bacillary Band
#roypath
histopathology-india.net

Trichuris trichiura (human whipworm) is a soil transmitted helminth

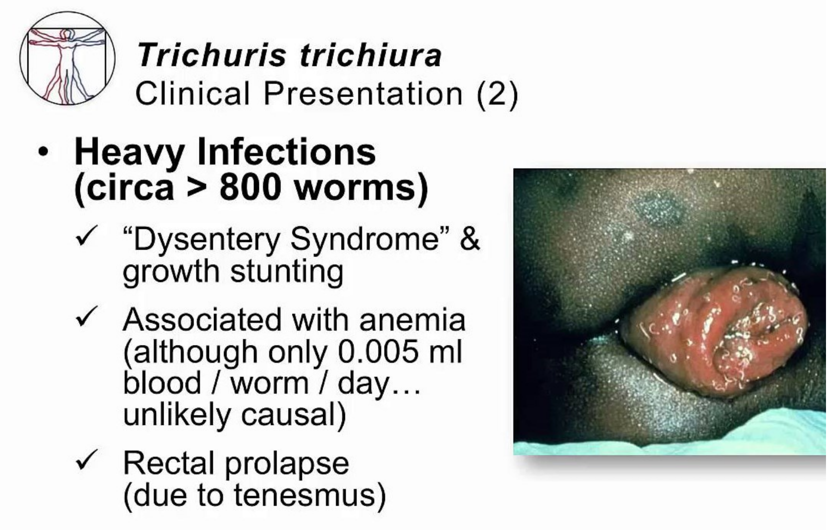
Lemon-shaped egg with clear opercula at both ends

Lives in colon & rectum

Spread by fecal-oral route

Leaves intestine through anus & deposit eggs in the surrounding skin

Heavy infection -Abdominal pain, anorexia, diarrhea



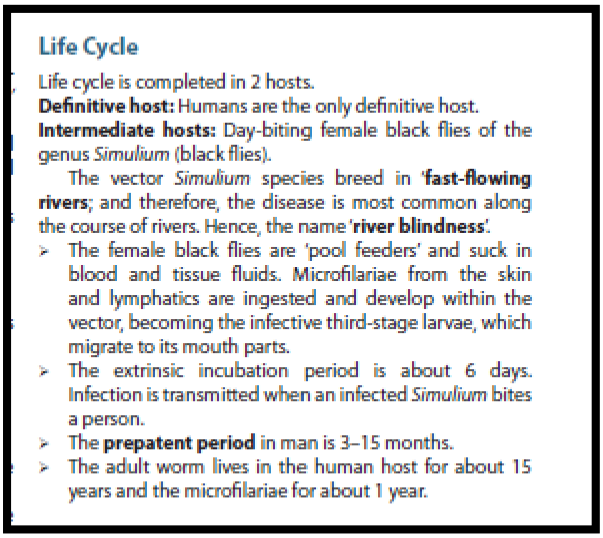
Trichuris trichiura
Clinical Presentation (2)

- **Heavy Infections (circa > 800 worms)**
  - ✓ "Dysentery Syndrome" & growth stunting
  - ✓ Associated with anemia (although only 0.005 ml blood / worm / day… unlikely causal)
  - ✓ Rectal prolapse (due to tenesmus)

355. River blindness is caused by

a) Onchocerca volvulus
b) Clonerchis sinensis
c) Dracunculus medinensis
d) Loa loa
e) Wuchereira bancrofti

Key a

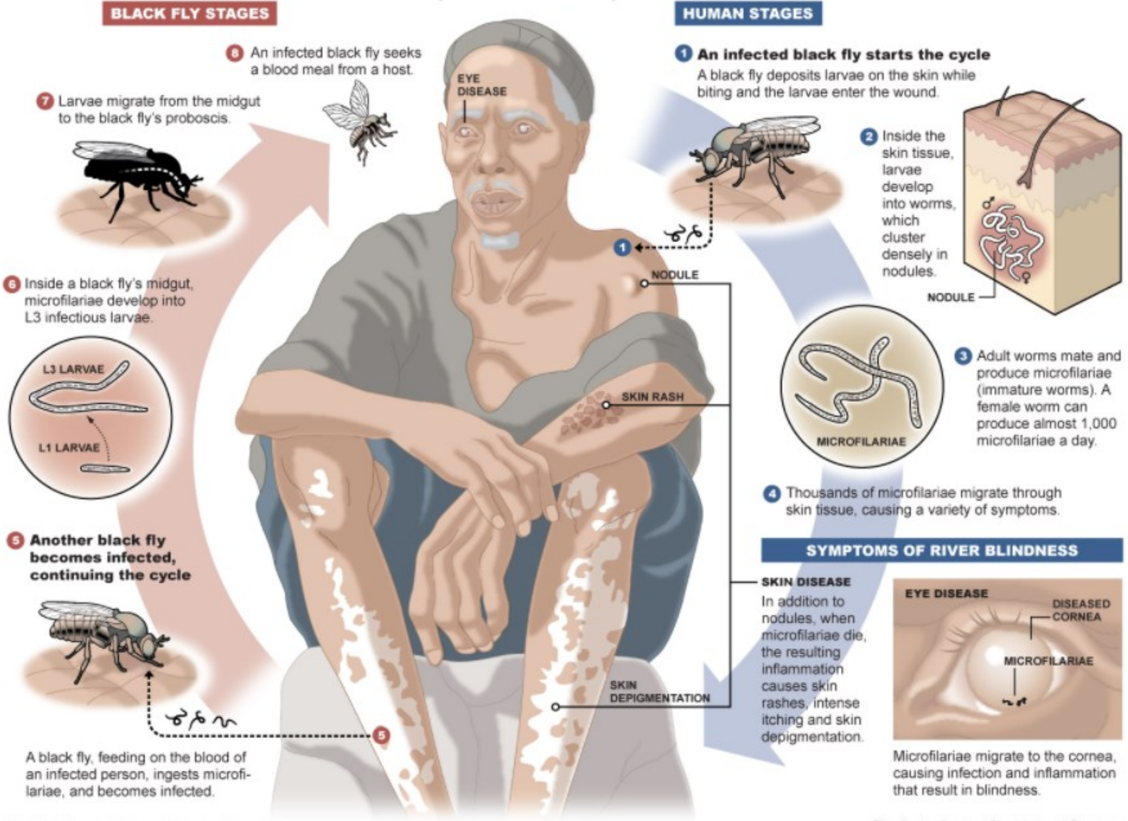


Life Cycle

Life cycle is completed in 2 hosts.
Definitive host: Humans are the only definitive host.
Intermediate hosts: Day-biting female black flies of the genus *Simulium* (black flies).

The vector *Simulium* species breed in '**fast-flowing rivers**'; and therefore, the disease is most common along the course of rivers. Hence, the name '**river blindness**'.

- The female black flies are 'pool feeders' and suck in blood and tissue fluids. Microfilariae from the skin and lymphatics are ingested and develop within the vector, becoming the infective third-stage larvae, which migrate to its mouth parts.
- The extrinsic incubation period is about 6 days. Infection is transmitted when an infected *Simulium* bites a person.
- The **prepatent period** in man is 3–15 months.
- The adult worm lives in the human host for about 15 years and the microfilariae for about 1 year.



The Life Cycle of River Blindness

(Onchocerciasis)

BLACK FLY STAGES

HUMAN STAGES

① An infected black fly starts the cycle

A black fly deposits larvae on the skin while biting and the larvae enter the wound.

② Inside the skin tissue, larvae develop into worms, which cluster densely in nodules.

③ Adult worms mate and produce microfilariae (immature worms). A female worm can produce almost 1,000 microfilariae a day.

④ Thousands of microfilariae migrate through skin tissue, causing a variety of symptoms.

⑤ Another black fly becomes infected, continuing the cycle

A black fly, feeding on the blood of an infected person, ingests microfilariae, and becomes infected.

⑥ Inside a black fly's midgut, microfilariae develop into L3 infectious larvae.

⑦ Larvae migrate from the midgut to the black fly's proboscis.

⑧ An infected black fly seeks a blood meal from a host.

SYMPTOMS OF RIVER BLINDNESS

SKIN DISEASE

In addition to nodules, when microfilariae die, the resulting inflammation causes skin rashes, intense itching and skin depigmentation.

EYE DISEASE

Microfilariae migrate to the cornea, causing infection and inflammation that result in blindness.

SOURCE: Centers for Disease Control and Prevention

The Carter Center / Graphic by Al Granberg

356. Ingestion of encysted larvae within undercooked or raw crab meat can result in infection with

a) Clonerchis sinensis
b) Diphyllobothrium latum
c) Anisakis simplex
d) Paragonimus westermani
e) Hymenolepis nana

Key d (MICRO PPL)

Paragonimus westermani, commonly known as the Oriental lung fluke, is a parasitic trematode that causes paragonimiasis. Humans become infected by ingesting encysted larvae (metacercariae) in raw, undercooked, or pickled crab or crayfish.

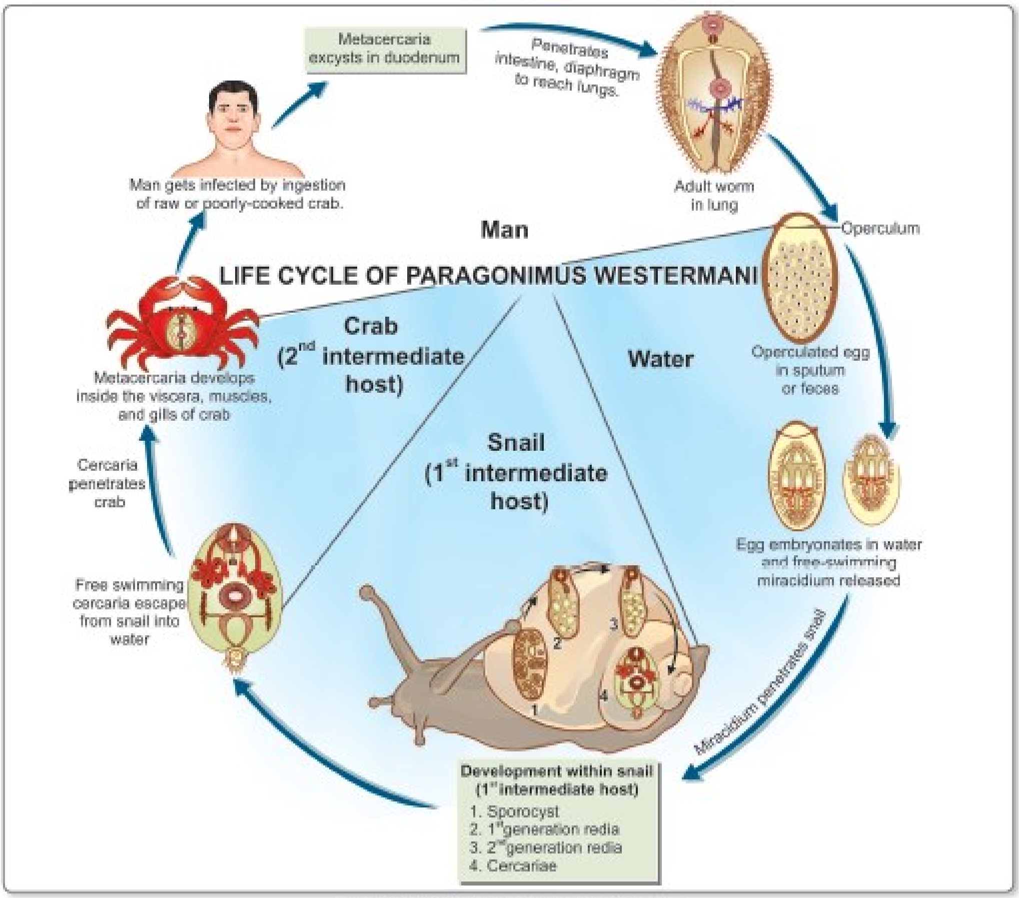
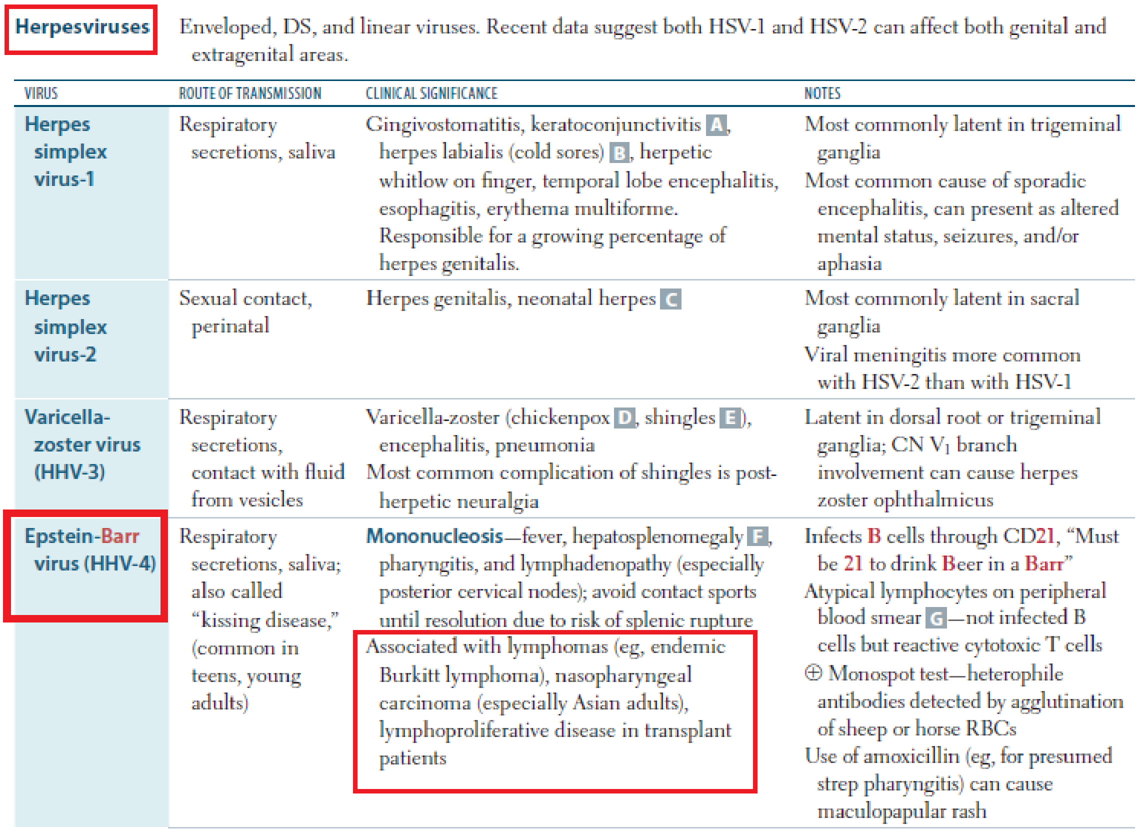

Metacercaria excysts in duodenum
Penetrates intestine, diaphragm to reach lungs.
Adult worm in lung
Operculum
Operculated egg in sputum or feces
Egg embryonates in water and free-swimming miracidium released
Miracidium penetrates snail
Development within snail (1st intermediate host)
1. Sporocyst
2. 1st generation redia
3. 2nd generation redia
4. Cercariae
1
2
3
4
Free swimming cercaria escape from snail into water
Cercaria penetrates crab
Metacercaria develops inside the viscera, muscles, and gills of crab
Man gets infected by ingestion of raw or poorly-cooked crab.
Man
LIFE CYCLE OF PARAGONIMUS WESTERMANI
Crab (2nd intermediate host)
Water
Snail (1st intermediate host)

Fig. 13.18: Life cycle of *Paragonimus westermani*

357. Epstein- Barr virus is a microbial carcinogen associated with

a) Burkitt's lymphoma
b) Squamous cell carcinoma of the lungs
c) Adenocarcinoma of thyroid
d) Squamous cell carcinoma of the stomach
e) Transitional cell carcinoma of the urinary bladder

Key a



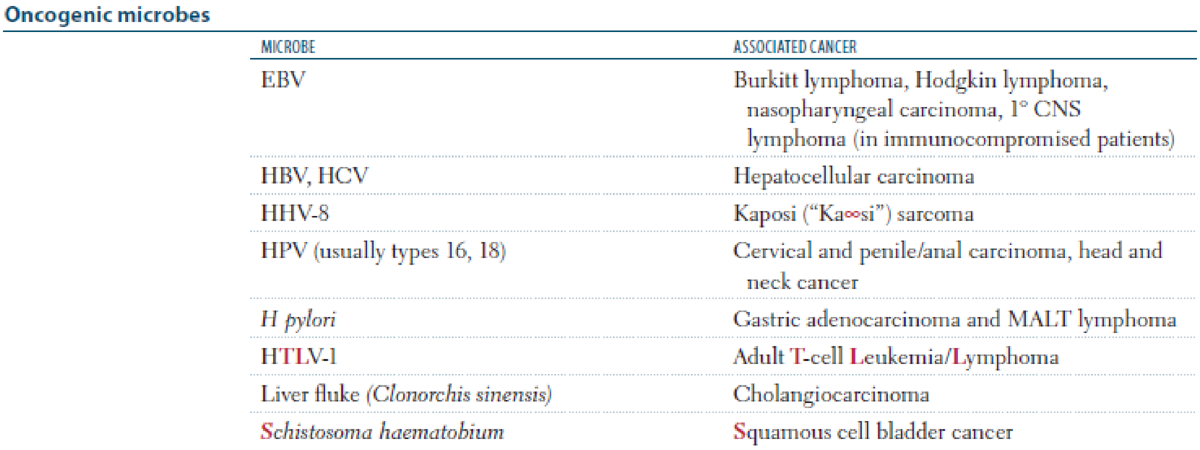
Herpesviruses Enveloped, DS, and linear viruses. Recent data suggest both HSV-1 and HSV-2 can affect both genital and extragenital areas.

VIRUS	ROUTE OF TRANSMISSION	CLINICAL SIGNIFICANCE	NOTES
Herpes simplex virus-1	Respiratory secretions, saliva	Gingivostomatitis, keratoconjunctivitis A, herpes labialis (cold sores) B, herpetic whitlow on finger, temporal lobe encephalitis, esophagitis, erythema multiforme. Responsible for a growing percentage of herpes genitalis.	Most commonly latent in trigeminal ganglia Most common cause of sporadic encephalitis, can present as altered mental status, seizures, and/or aphasia
Herpes simplex virus-2	Sexual contact, perinatal	Herpes genitalis, neonatal herpes C	Most commonly latent in sacral ganglia Viral meningitis more common with HSV-2 than with HSV-1
Varicella-zoster virus (HHV-3)	Respiratory secretions, contact with fluid from vesicles	Varicella-zoster (chickenpox D, shingles E), encephalitis, pneumonia Most common complication of shingles is post-herpetic neuralgia	Latent in dorsal root or trigeminal ganglia; CN V_1 branch involvement can cause herpes zoster ophthalmicus
Epstein-Barr virus (HHV-4)	Respiratory secretions, saliva; also called "kissing disease," (common in teens, young adults)	**Mononucleosis**—fever, hepatosplenomegaly F, pharyngitis, and lymphadenopathy (especially posterior cervical nodes); avoid contact sports until resolution due to risk of splenic rupture Associated with lymphomas (eg, endemic Burkitt lymphoma), nasopharyngeal carcinoma (especially Asian adults), lymphoproliferative disease in transplant patients	Infects B cells through CD21, "Must be 21 to drink Beer in a Barr" Atypical lymphocytes on peripheral blood smear G—not infected B cells but reactive cytotoxic T cells ⊕ Monospot test—heterophile antibodies detected by agglutination of sheep or horse RBCs Use of amoxicillin (eg, for presumed strep pharyngitis) can cause maculopapular rash

358. Cervical and anal carcinoma are most probably caused by

a) Herpes simplex type 2 virus
b) Human immunodeficiency virus
c) Herpes simplex type 1 virus
d) Human herpes virus 8
e) Human papilloma virus

Key e



Oncogenic microbes

MICROBE	ASSOCIATED CANCER
EBV	Burkitt lymphoma, Hodgkin lymphoma, nasopharyngeal carcinoma, 1° CNS lymphoma (in immunocompromised patients)
HBV, HCV	Hepatocellular carcinoma
HHV-8	Kaposi ("Ka∞si") sarcoma
HPV (usually types 16, 18)	Cervical and penile/anal carcinoma, head and neck cancer
H pylori	Gastric adenocarcinoma and MALT lymphoma
HTLV-1	Adult T-cell Leukemia/Lymphoma
Liver fluke (*Clonorchis sinensis*)	Cholangiocarcinoma
Schistosoma haematobium	Squamous cell bladder cancer

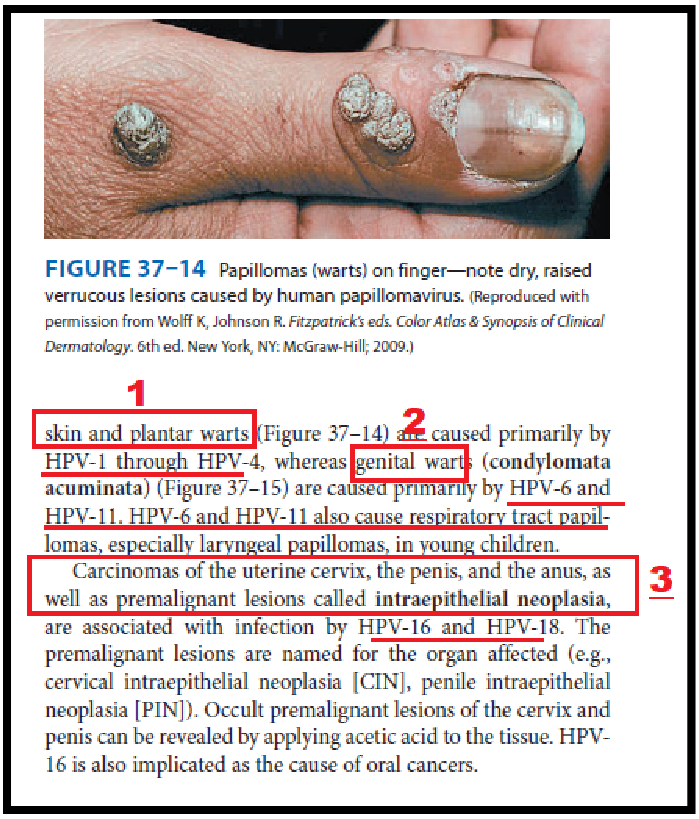


FIGURE 37–14 Papillomas (warts) on finger—note dry, raised verrucous lesions caused by human papillomavirus. (Reproduced with permission from Wolff K, Johnson R. *Fitzpatrick's eds. Color Atlas & Synopsis of Clinical Dermatology*. 6th ed. New York, NY: McGraw-Hill; 2009.)

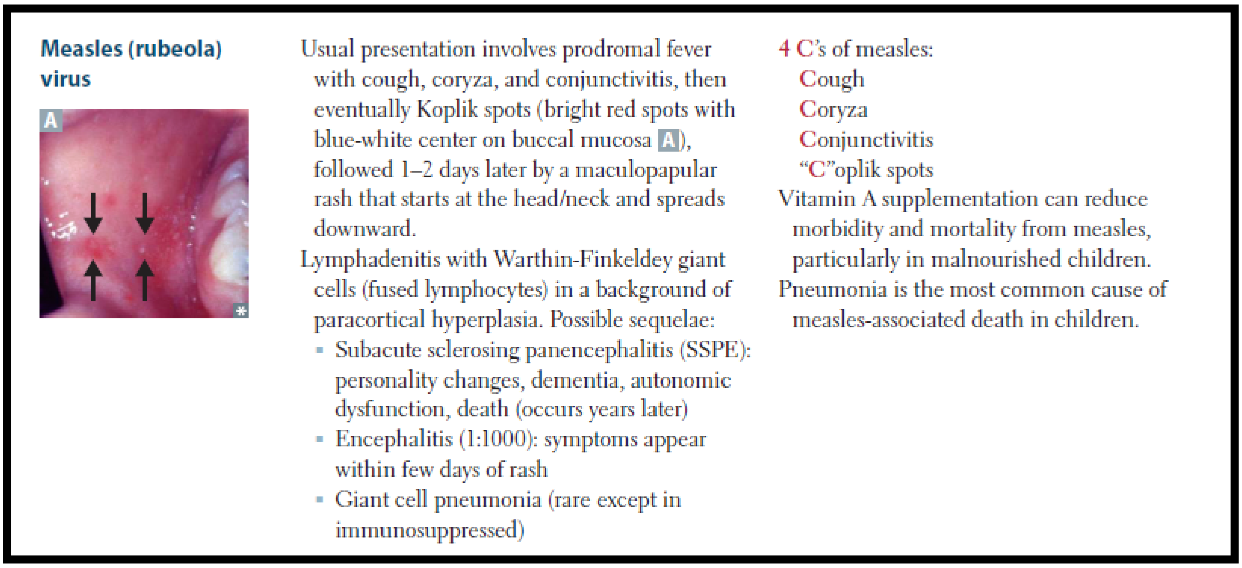
skin and plantar warts (Figure 37–14) are caused primarily by HPV-1 through HPV-4, whereas genital warts (**condylomata acuminata**) (Figure 37–15) are caused primarily by HPV-6 and HPV-11. HPV-6 and HPV-11 also cause respiratory tract papillomas, especially laryngeal papillomas, in young children.

Carcinomas of the uterine cervix, the penis, and the anus, as well as premalignant lesions called **intraepithelial neoplasia**, are associated with infection by HPV-16 and HPV-18. The premalignant lesions are named for the organ affected (e.g., cervical intraepithelial neoplasia [CIN], penile intraepithelial neoplasia [PIN]). Occult premalignant lesions of the cervix and penis can be revealed by applying acetic acid to the tissue. HPV-16 is also implicated as the cause of oral cancers.

359. Koplik's spots are diagnostic criterion for infection with

a) Measles
b) Chicken pox
c) Rubella
d) Mumps
e) Small pox

Key a



Measles (rubeola) virus

Usual presentation involves prodromal fever with cough, coryza, and conjunctivitis, then eventually Koplik spots (bright red spots with blue-white center on buccal mucosa A), followed 1–2 days later by a maculopapular rash that starts at the head/neck and spreads downward.

Lymphadenitis with Warthin-Finkeldey giant cells (fused lymphocytes) in a background of paracortical hyperplasia. Possible sequelae:

- Subacute sclerosing panencephalitis (SSPE): personality changes, dementia, autonomic dysfunction, death (occurs years later)
- Encephalitis (1:1000): symptoms appear within few days of rash
- Giant cell pneumonia (rare except in immunosuppressed)

4 C's of measles:
Cough
Coryza
Conjunctivitis
"C"oplik spots

Vitamin A supplementation can reduce morbidity and mortality from measles, particularly in malnourished children.

Pneumonia is the most common cause of measles-associated death in children.

360. The mode of transmission of Polio virus is

a) Unprotected sexual intercourse
b) Airborne droplet transmission
c) Feco-oral route
d) Transfusion of infected blood products
e) Bite of infected female culex mosquito

Key c

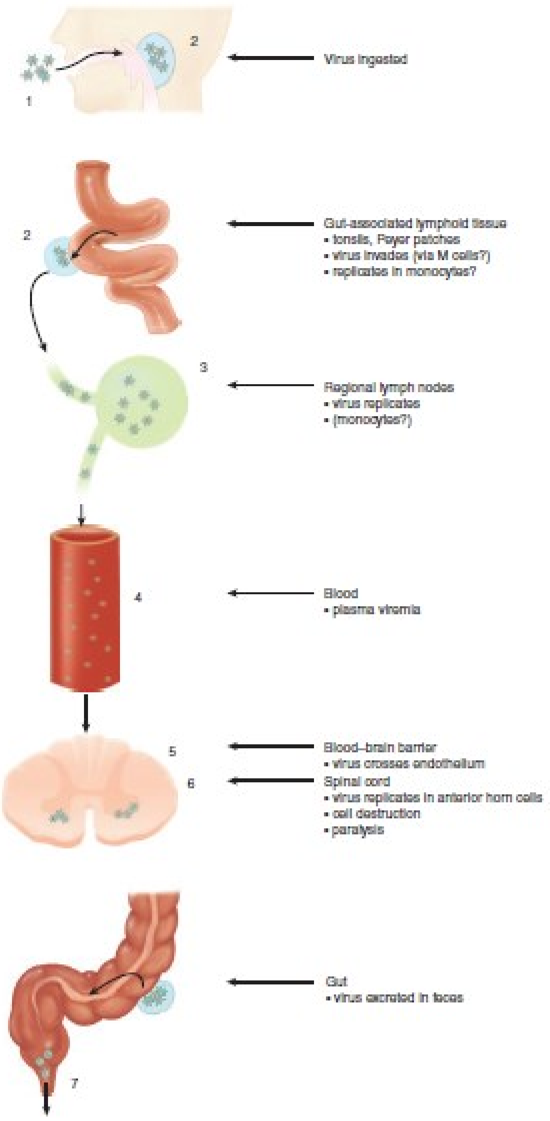
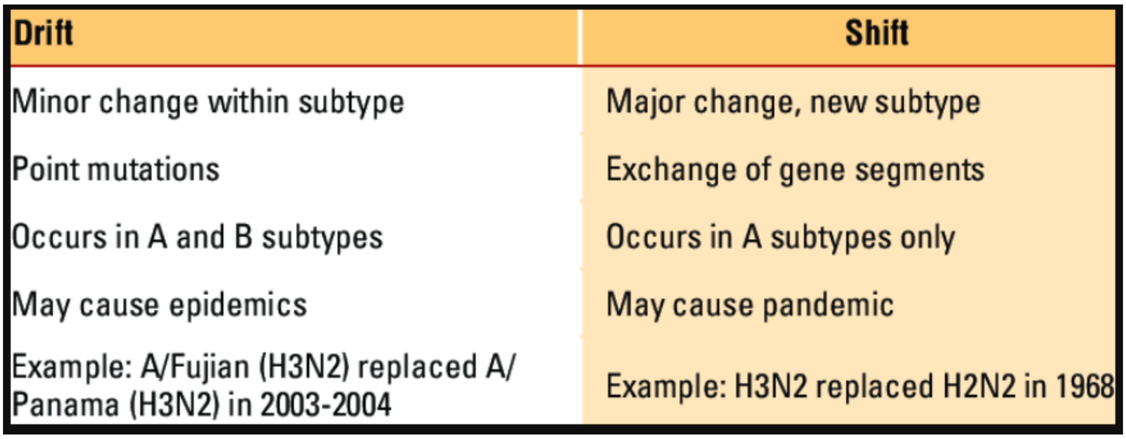

1
2
Virus ingested
2
Gut-associated lymphoid tissue
• tonsils, Peyer patches
• virus invades (via M cells?)
• replicates in monocytes?
3
Regional lymph nodes
• virus replicates
• (monocytes?)
4
Blood
• plasma viremia
5
Blood–brain barrier
• virus crosses endothelium
6
Spinal cord
• virus replicates in anterior horn cells
• cell destruction
• paralysis
Gut
• virus excreted in feces
7

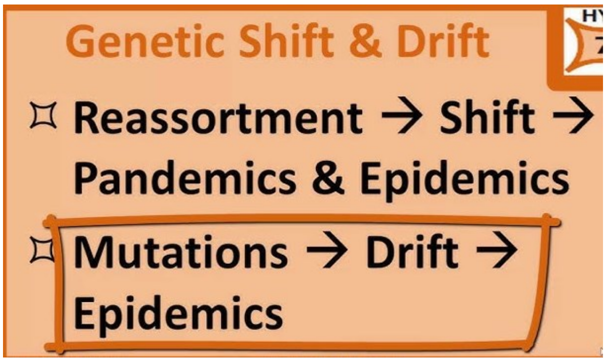
FIGURE 7–1. **Stages of poliovirus pathogenesis.** The diagram illustrates multiple steps of poliovirus pathogenesis, starting from virus entry through oropharynx (fecal–oral transmission), virus multiplication at the site of entry (gut), invasion of the virus to the regional lymph nodes, development of viremia, virus shed in feces, virus crossing the blood–brain barrier, virus replication in anterior horn cells, cell destruction, motor neurons are damaged, and development of paralysis.

361. Antigenic shift and antigenic drift are seen in case of

a) Influenza
b) Hepatitis B
c) Polio
d) Rabies
e) HIV
Key a

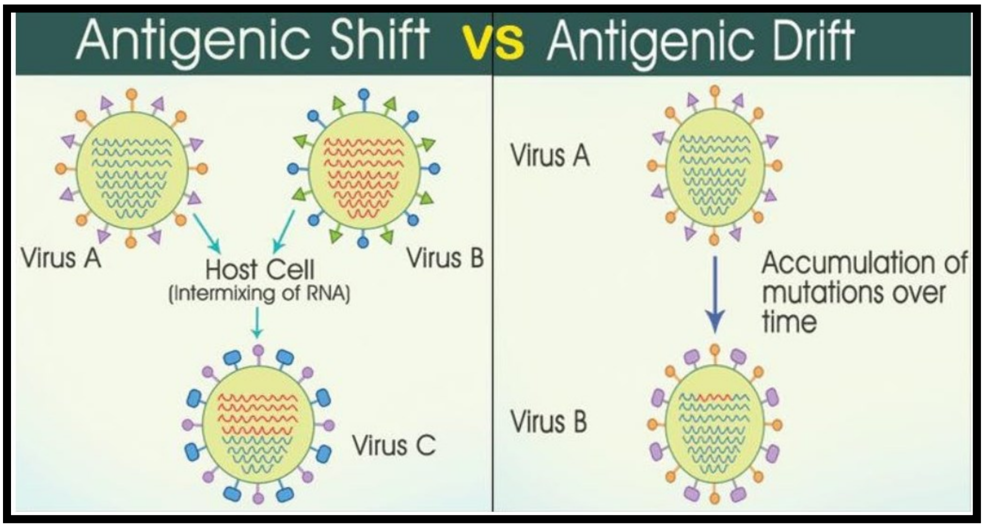


Drift	Shift
Minor change within subtype	Major change, new subtype
Point mutations	Exchange of gene segments
Occurs in A and B subtypes	Occurs in A subtypes only
May cause epidemics	May cause pandemic
Example: A/Fujian (H3N2) replaced A/ Panama (H3N2) in 2003-2004	Example: H3N2 replaced H2N2 in 1968



Genetic Shift & Drift

- Reassortment → Shift → Pandemics & Epidemics
- Mutations → Drift → Epidemics


Antigenic Shift vs Antigenic Drift
Virus A
Host Cell
(Intermixing of RNA)
Virus B
Virus C
Virus A
Accumulation of mutations over time
Virus B

362. The mode of transmission of Hepatitis E is

a) Transfusion of infected blood products
b) Bite of infected female anopheles mosquito
c) Airborne droplet transmission
d) Feco- oral route
e) Unprotected sexual intercourse
Key d

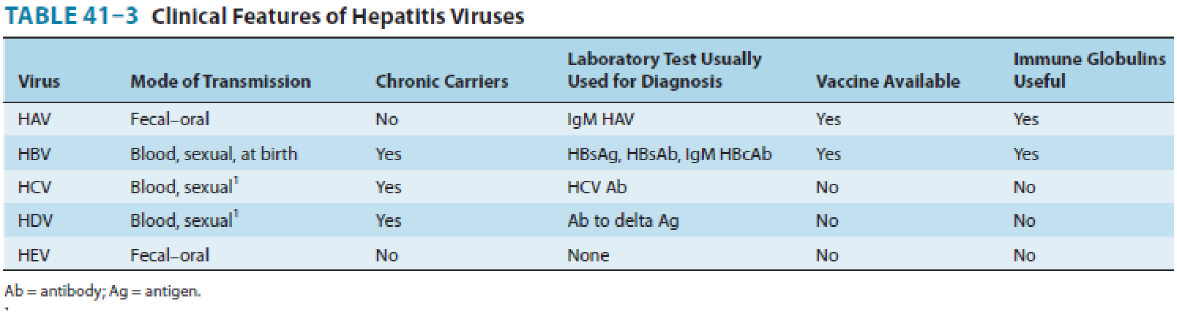


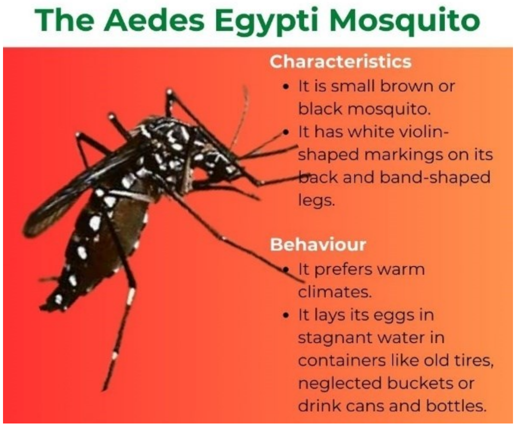
TABLE 41–3 Clinical Features of Hepatitis Viruses

Virus	Mode of Transmission	Chronic Carriers	Laboratory Test Usually Used for Diagnosis	Vaccine Available	Immune Globulins Useful
HAV	Fecal–oral	No	IgM HAV	Yes	Yes
HBV	Blood, sexual, at birth	Yes	HBsAg, HBsAb, IgM HBcAb	Yes	Yes
HCV	Blood, sexual[1]	Yes	HCV Ab	No	No
HDV	Blood, sexual[1]	Yes	Ab to delta Ag	No	No
HEV	Fecal–oral	No	None	No	No

Ab = antibody; Ag = antigen.

363. Dengue virus is transmitted by the bite of infected female ....mosquito.

a) Anopheles
b) Culiseta
c) Haemogoggus
d) Culex
e) Aedes
Key e



The Aedes Egypti Mosquito

Characteristics

- It is small brown or black mosquito.
- It has white violin-shaped markings on its back and band-shaped legs.

Behaviour

- It prefers warm climates.
- It lays its eggs in stagnant water in containers like old tires, neglected buckets or drink cans and bottles.

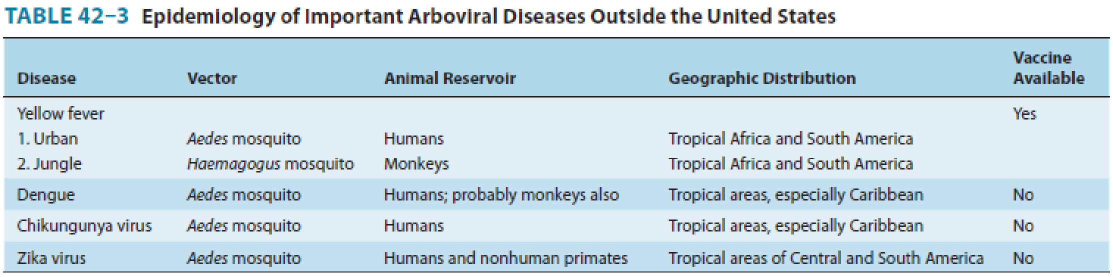


TABLE 42–3 Epidemiology of Important Arboviral Diseases Outside the United States

Disease	Vector	Animal Reservoir	Geographic Distribution	Vaccine Available
Yellow fever				Yes
1. Urban	*Aedes* mosquito	Humans	Tropical Africa and South America	
2. Jungle	*Haemagogus* mosquito	Monkeys	Tropical Africa and South America	
Dengue	*Aedes* mosquito	Humans; probably monkeys also	Tropical areas, especially Caribbean	No
Chikungunya virus	*Aedes* mosquito	Humans	Tropical areas, especially Caribbean	No
Zika virus	*Aedes* mosquito	Humans and nonhuman primates	Tropical areas of Central and South America	No

☐ West Nile virus infection (West Nile virus, Culex mosquito)
☐ Japanese encephalitis (Japanese encephalitis virus, Culex mosquito)

364. Vector for malaria is:

a) Sandfly
b) Mosquito
c) Ticks
d) Bug

Key b

☐ Lymphatic Filariasis

- **Vector: *Culex* mosquitoes (e.g., *Culex pipiens*), *Anopheles* mosquitoes, *Aedes* mosquitoes**
- **Pathogen: *Wuchereria bancrofti*, *Brugia malayi*, *Brugia timori***

☐ Leishmaniasis

- **Vector: *Phlebotomine sandflies* (e.g., *Phlebotomus spp.*, *Lutzomyia spp.*)**
- **Pathogen: *Leishmania* spp. (e.g., *Leishmania donovani, Leishmania major, Leishmania tropica*)**

☐ African Trypanosomiasis (Sleeping Sickness)

- **Vector: *Tsetse flies* (e.g., *Glossina morsitans, Glossina palpalis*)**
- **Pathogen: *Trypanosoma brucei* spp. (e.g., *T. b. gambiense, T. b. rhodesiense*)**

☐ Chagas Disease (American Trypanosomiasis)

- **Vector: *Triatomine bugs* (e.g., *Triatoma infestans, Rhodnius prolixus, Panstrongylus megistus*)**
- **Pathogen: *Trypanosoma cruzi***

☐ Loa loa (African Eye Worm)

- **Vector: *Chrysops* flies (e.g., *Chrysops silacea, Chrysops dimidiata*)**
- **Pathogen: *Loa loa* (a filarial worm)**

☐ Onchocerciasis (River Blindness)

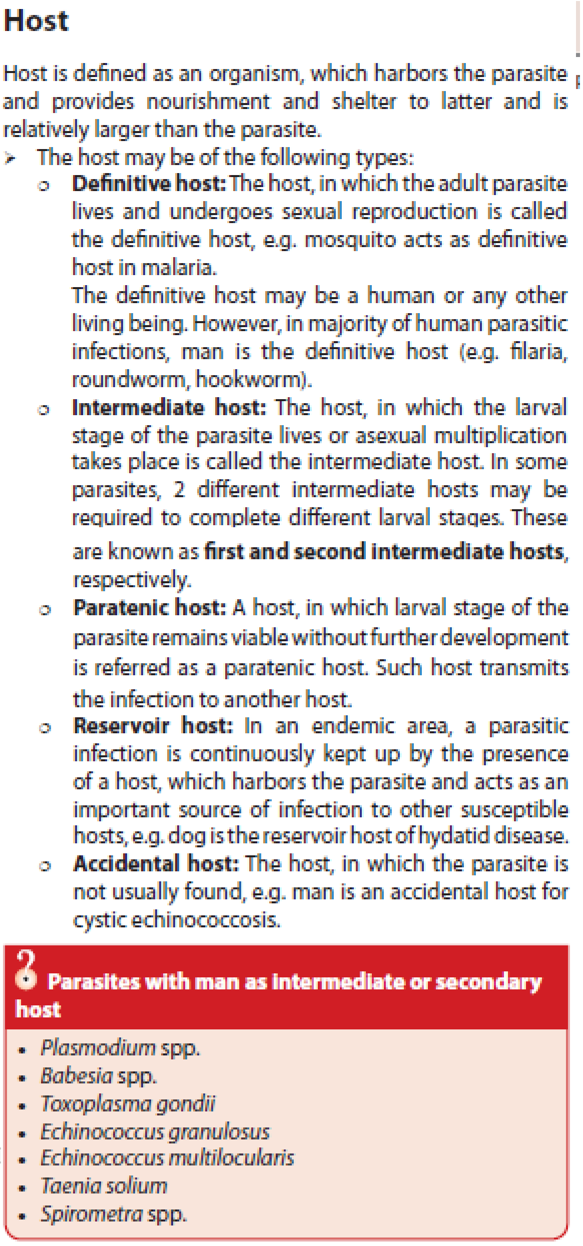
- **Vector: *Blackflies* (e.g., *Simulium spp.*)**
- **Pathogen: *Onchocerca volvulus***

365. The host in which sexual cycle takes place is called:

a) Definitive host
b) Intermediate
c) Paratenic

d) Transport

Key a



Host

Host is defined as an organism, which harbors the parasite and provides nourishment and shelter to latter and is relatively larger than the parasite.

- The host may be of the following types:
  - **Definitive host:** The host, in which the adult parasite lives and undergoes sexual reproduction is called the definitive host, e.g. mosquito acts as definitive host in malaria.
    The definitive host may be a human or any other living being. However, in majority of human parasitic infections, man is the definitive host (e.g. filaria, roundworm, hookworm).
  - **Intermediate host:** The host, in which the larval stage of the parasite lives or asexual multiplication takes place is called the intermediate host. In some parasites, 2 different intermediate hosts may be required to complete different larval stages. These are known as **first and second intermediate hosts**, respectively.
  - **Paratenic host:** A host, in which larval stage of the parasite remains viable without further development is referred as a paratenic host. Such host transmits the infection to another host.
  - **Reservoir host:** In an endemic area, a parasitic infection is continuously kept up by the presence of a host, which harbors the parasite and acts as an important source of infection to other susceptible hosts, e.g. dog is the reservoir host of hydatid disease.
  - **Accidental host:** The host, in which the parasite is not usually found, e.g. man is an accidental host for cystic echinococcosis.

Parasites with man as intermediate or secondary host

- *Plasmodium* spp.
- *Babesia* spp.
- *Toxoplasma gondii*
- *Echinococcus granulosus*
- *Echinococcus multilocularis*
- *Taenia solium*
- *Spirometra* spp.

366. Amoeba moves by means of:

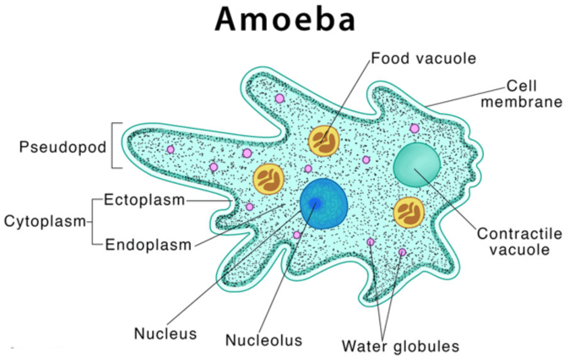
a) Feet

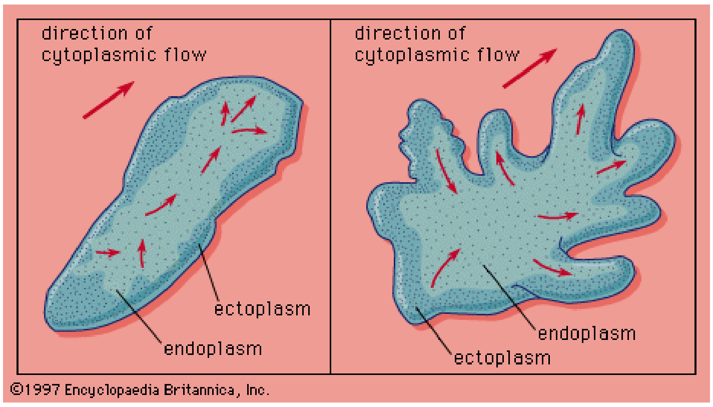
b) Wings

c) Pseudopodia

d) Pilli

Key c




direction of cytoplasmic flow
ectoplasm
endoplasm
direction of cytoplasmic flow
endoplasm
ectoplasm
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367. Mature cyst of Entamoeba histolytica contains nuclei:

a) 4
b) 3
c) 2
d) 5

Key a

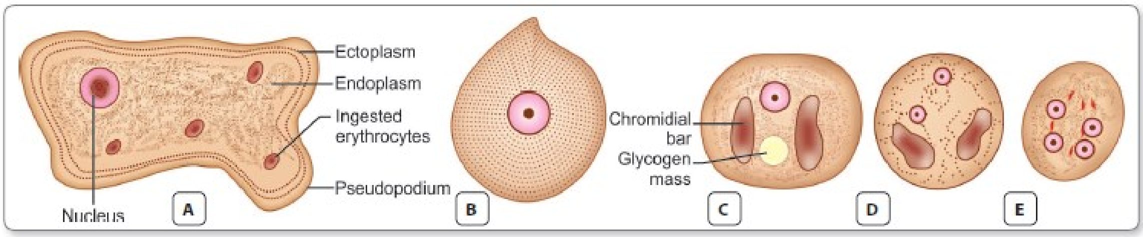
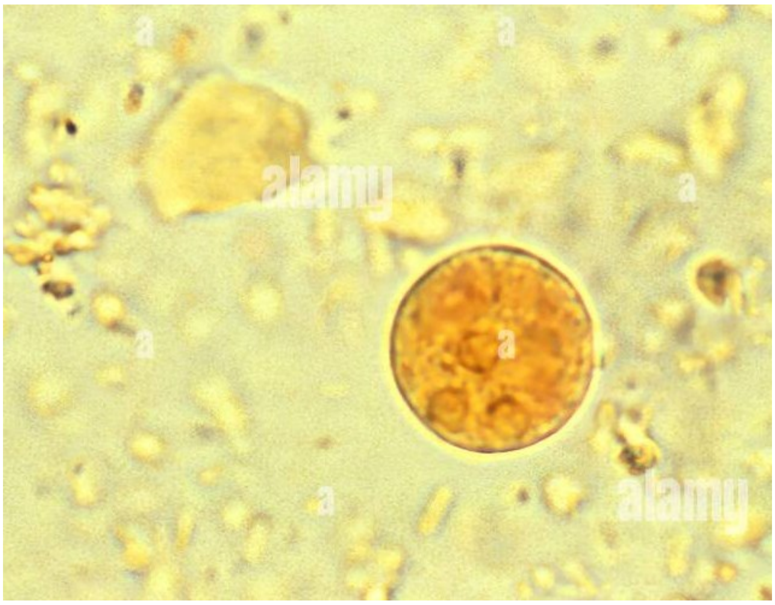
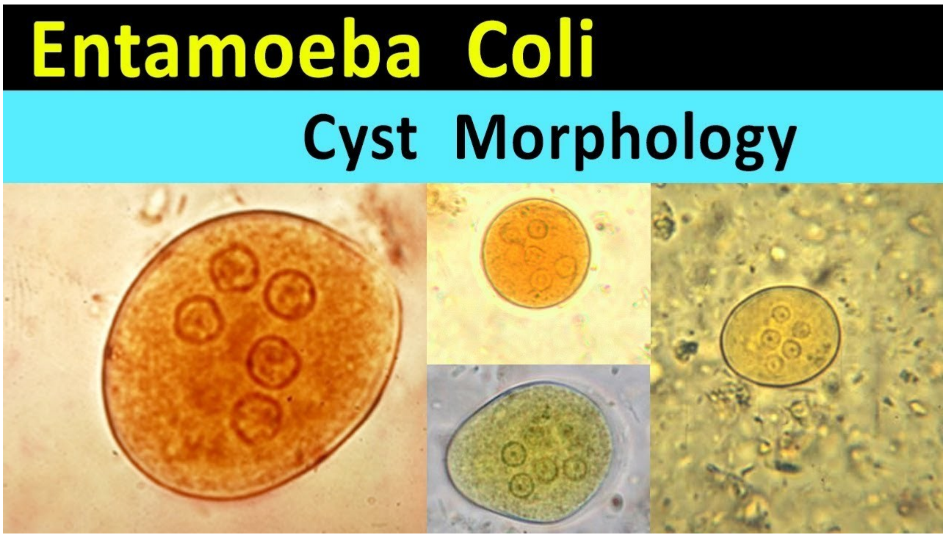

Ectoplasm
Endoplasm
Ingested erythrocytes
Pseudopodium
Nucleus
A
B
Chromidial bar
Glycogen mass
C
D
E

Fig. 3.1: *Entamoeba histolytica.* **A.** Trophozoite; **B.** Precystic stage; **C.** Uninucleate cyst; **D.** Binucleate cyst; **E.** Mature quadrinucleate cyst


alamy
alamy


Entamoeba Coli
Cyst Morphology

368. Movement of Giardia lamblia is like:

- a) Gliding
- b) Rotatory
- c) Falling leaf
- d) Jerky

Key c

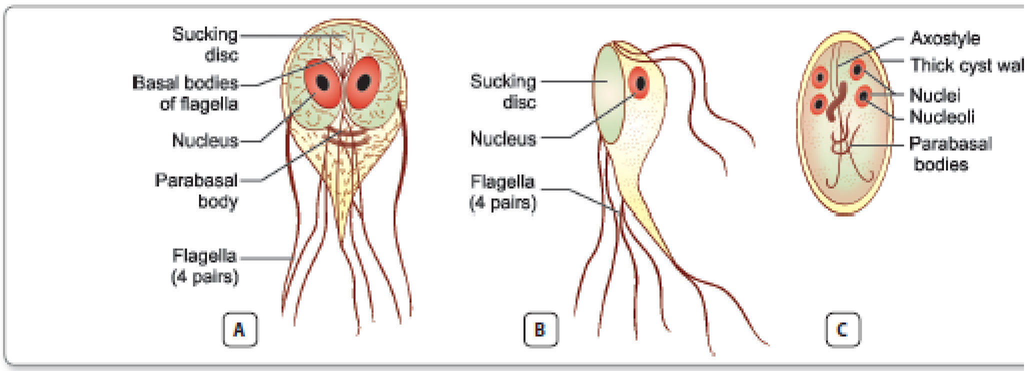
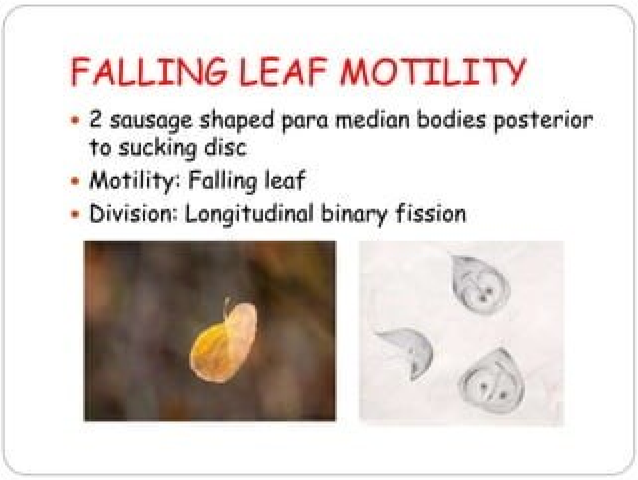

Sucking disc
Basal bodies of flagella
Nucleus
Parabasal body
Flagella (4 pairs)
A
Sucking disc
Nucleus
Flagella (4 pairs)
B
Axostyle
Thick cyst wal
Nuclei
Nucleoli
Parabasal bodies
C

Fig. 4.2: Trophozoite. **A.** Ventral view; **B.** Lateral view; **C.** Quadrinucleate Cyst


FALLING LEAF MOTILITY

- 2 sausage shaped para median bodies posterior to sucking disc
- Motility: Falling leaf
- Division: Longitudinal binary fission

369. Trichomonas hominis is found in:

- a) Vagina
- b) Duodenum
- c) Urinary bladder
- d) Caecum

Key D (corrected)

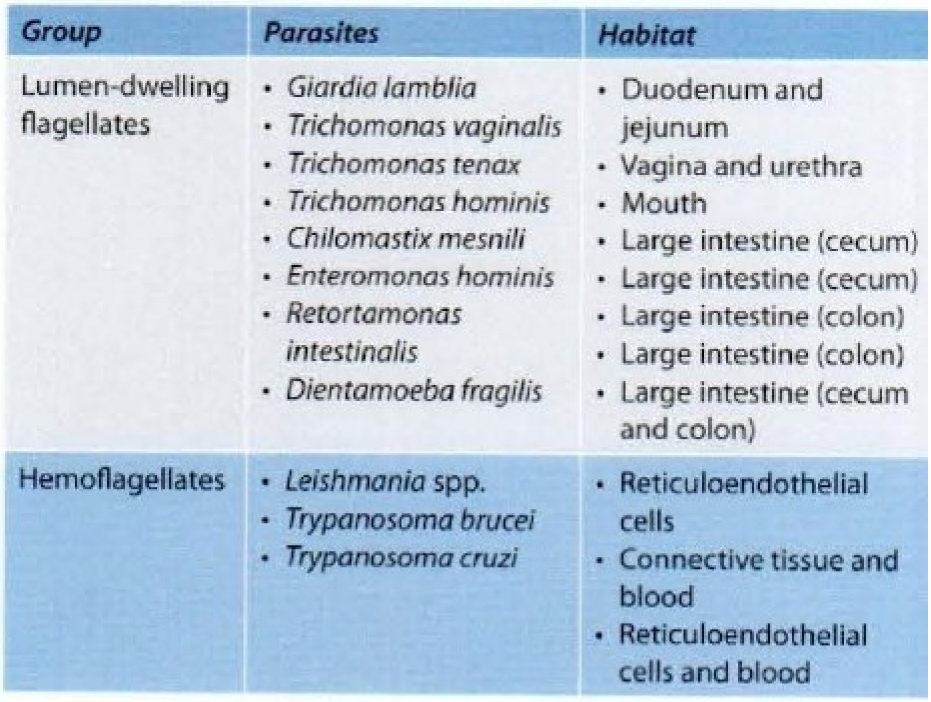
1. **Clinical Significance:**
   - **Considered non-pathogenic in humans, meaning it does not cause disease under normal conditions.**
   - **Often found as a commensal organism.**

370. Which one of the following is a haemoflagellate:

- a) Trichomonas vaginalis
- b) Plasmodium
- c) Leishmania
- d) Trypanosoma

Key d (BOTH C AND D CORRECT)

Table 1: Flagellates



Group	*Parasites*	*Habitat*
Lumen-dwelling flagellates	*Giardia lamblia*	Duodenum and jejunum
	Trichomonas vaginalis	Vagina and urethra
	Trichomonas tenax	Mouth
	Trichomonas hominis	Large intestine (cecum)
	Chilomastix mesnili	Large intestine (cecum)
	Enteromonas hominis	Large intestine (colon)
	Retortamonas intestinalis	Large intestine (colon)
	Dientamoeba fragilis	Large intestine (cecum and colon)
Hemoflagellates	*Leishmania* spp.	Reticuloendothelial cells
	Trypanosoma brucei	Connective tissue and blood
	Trypanosoma cruzi	Reticuloendothelial cells and blood

371. Kinyoun's (cold) acid fast staining is used for detection of:

- a) MTB

Key d CORRECT

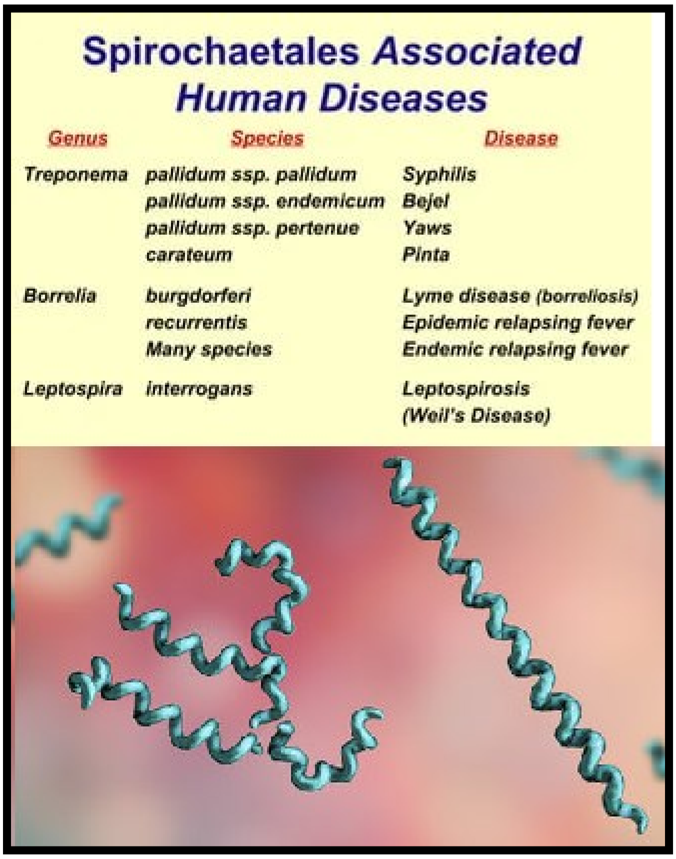
372. Painless haematuria is a typical manifestation of:

- a) S. hematobium
- b) S. mansoni

c) S. japonicum
d) None of them
Key a

373. Which of the following is spiral?

a) Treponema
b) Borrelia
c) Leptospira
d) All of the above
Key d

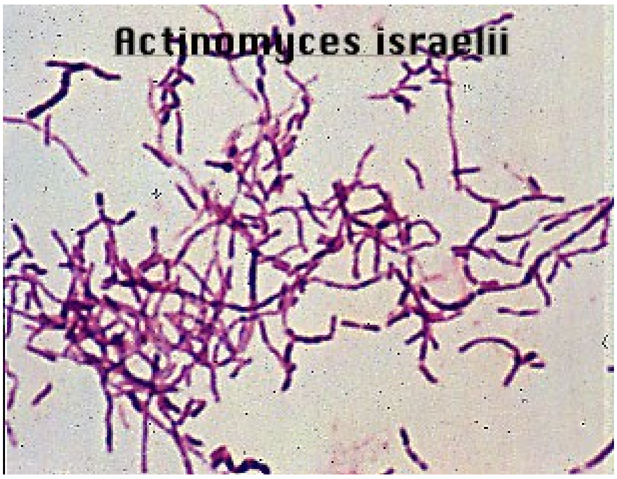


Spirochaetales Associated Human Diseases

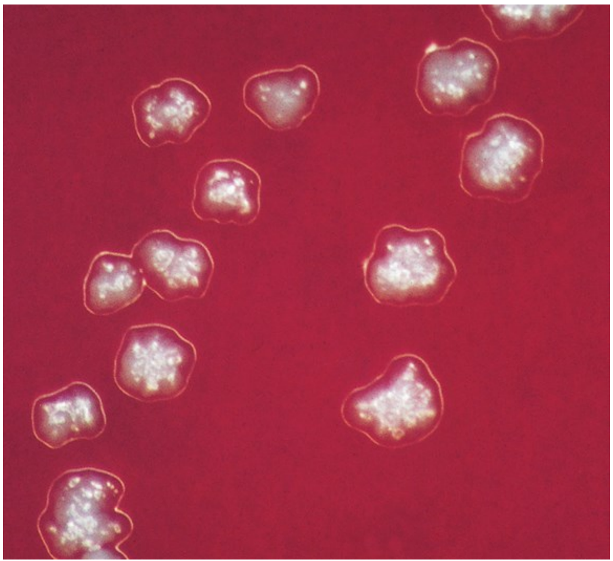
Genus	Species	Disease
Treponema	pallidum ssp. pallidum	Syphilis
	pallidum ssp. endemicum	Bejel
	pallidum ssp. pertenue	Yaws
	carateum	Pinta
Borrelia	burgdorferi	Lyme disease (borreliosis)
	recurrentis	Epidemic relapsing fever
	Many species	Endemic relapsing fever
Leptospira	interrogans	Leptospirosis (Weil's Disease)

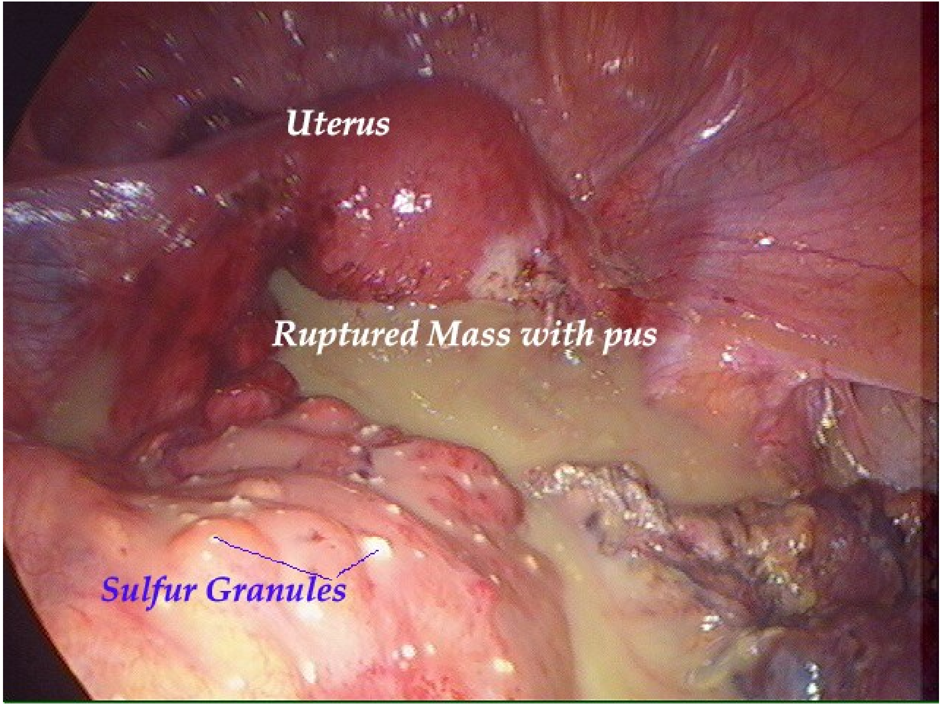
374. The presence of sulphur granules is diagnostic of

a) Actinomycosis
b) Candidosis
c) Viral infection
d) Keratocyte
Key a



Molar tooth morphology





375. The causative microorganism for Herpetic gingivostomatitis is

a) Herpes simplex bacteria
b) Herpes simplex virus
c) Herpes zoster virus
d) Borrelia vincentii
Key b

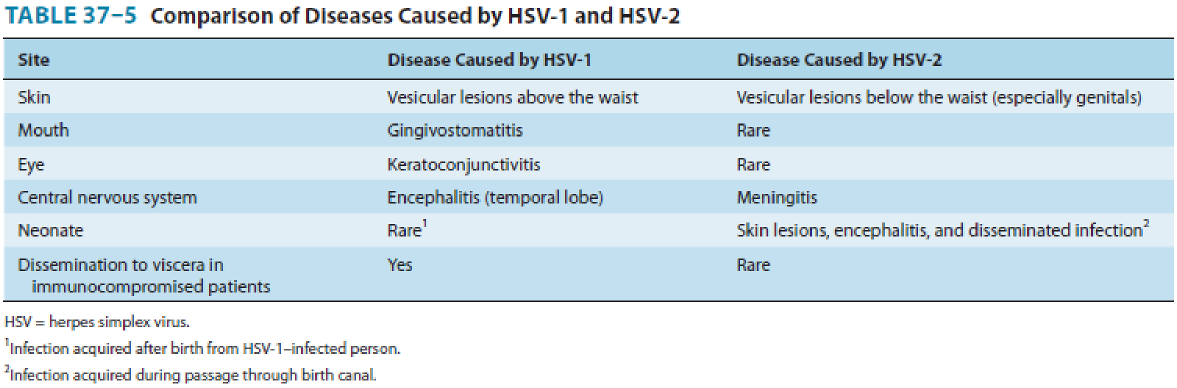


TABLE 37–5 Comparison of Diseases Caused by HSV-1 and HSV-2

Site	Disease Caused by HSV-1	Disease Caused by HSV-2
Skin	Vesicular lesions above the waist	Vesicular lesions below the waist (especially genitals)
Mouth	Gingivostomatitis	Rare
Eye	Keratoconjunctivitis	Rare
Central nervous system	Encephalitis (temporal lobe)	Meningitis
Neonate	Rare[1]	Skin lesions, encephalitis, and disseminated infection[2]
Dissemination to viscera in immunocompromised patients	Yes	Rare

HSV = herpes simplex virus.

[1] Infection acquired after birth from HSV-1–infected person.

[2] Infection acquired during passage through birth canal.

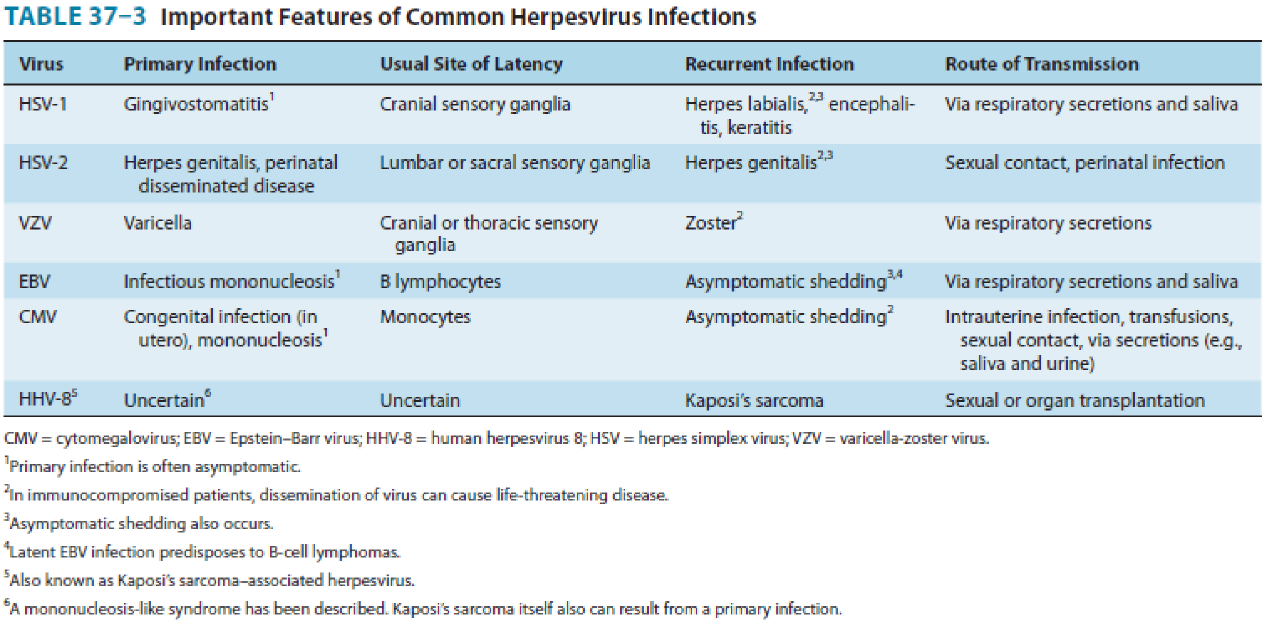


TABLE 37–3 Important Features of Common Herpesvirus Infections

Virus	Primary Infection	Usual Site of Latency	Recurrent Infection	Route of Transmission
HSV-1	Gingivostomatitis[1]	Cranial sensory ganglia	Herpes labialis,[2,3] encephalitis, keratitis	Via respiratory secretions and saliva
HSV-2	Herpes genitalis, perinatal disseminated disease	Lumbar or sacral sensory ganglia	Herpes genitalis[2,3]	Sexual contact, perinatal infection
VZV	Varicella	Cranial or thoracic sensory ganglia	Zoster[2]	Via respiratory secretions
EBV	Infectious mononucleosis[1]	B lymphocytes	Asymptomatic shedding[3,4]	Via respiratory secretions and saliva
CMV	Congenital infection (in utero), mononucleosis[1]	Monocytes	Asymptomatic shedding[2]	Intrauterine infection, transfusions, sexual contact, via secretions (e.g., saliva and urine)
HHV-8[5]	Uncertain[6]	Uncertain	Kaposi's sarcoma	Sexual or organ transplantation

CMV = cytomegalovirus; EBV = Epstein–Barr virus; HHV-8 = human herpesvirus 8; HSV = herpes simplex virus; VZV = varicella-zoster virus.

[1] Primary infection is often asymptomatic.

[2] In immunocompromised patients, dissemination of virus can cause life-threatening disease.

[3] Asymptomatic shedding also occurs.

[4] Latent EBV infection predisposes to B-cell lymphomas.

[5] Also known as Kaposi's sarcoma–associated herpesvirus.

[6] A mononucleosis-like syndrome has been described. Kaposi's sarcoma itself also can result from a primary infection.

376. The following are true about Pseudomonas aeruginosa except
a) It is the most common cause of contact lens acquired infection
b) It is a Gram-negative bacteria
c) It can cause osteomyelitis
d) It is sensitive to chloramphenicol
Key d

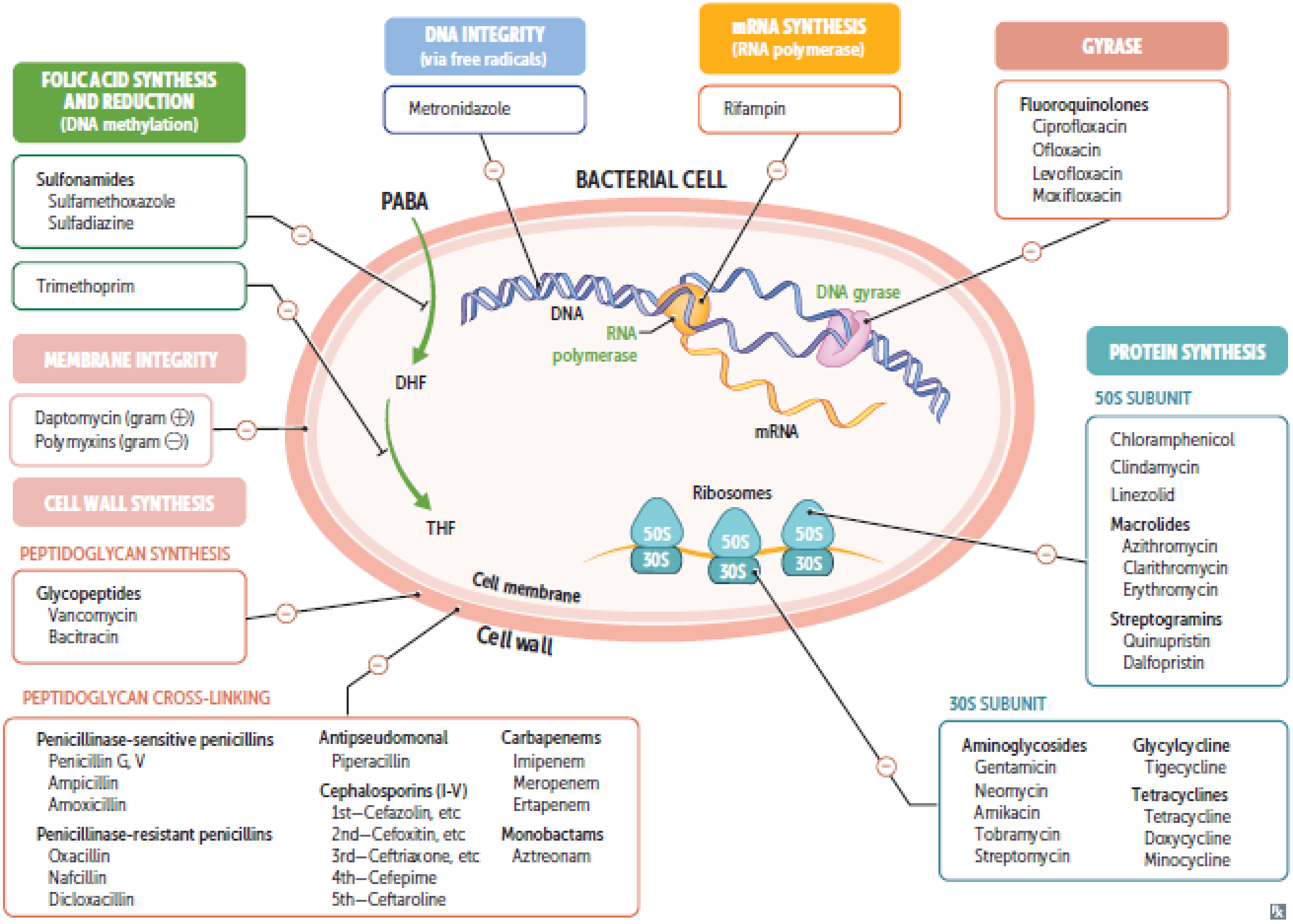
Here's why the other options are true:
a) It is the **most common cause of contact lens** acquired infection: *P. aeruginosa* is a leading cause of bacterial eye infections, especially in contact lens wearers, where it can cause keratitis.
b) It is a Gram-negative bacteria: *P. aeruginosa* is a Gram-negative, rod-shaped bacterium, characterized by its **distinctive blue-green pigment (due to pyocyanin)** and fruity odor.
c) It **can cause osteomyelitis**: *P. aeruginosa* can indeed cause osteomyelitis, especially in immunocompromised patients or following trauma, such as in diabetic foot infections.

For Pseudomonas intrinsic resistance remember "CATE":
Chloramphenicol, Cotrimoxazole, Ceftriaxone/Cefotaxime, Ampicillin, Ampicillin-sulbactam, Amoxicillin, Amoxicillin-clavulanate, Trimethoprim, Tetracycline, Tigecycline, Ertapenem

377. The following are true about Mantoux test except
a) Is positive in all patients with tuberculosis
b) Involves injecting PPD (purified protein derivative) intradermally
c) Is more sensitive than the tine test
d) Involves the CD4 cells
Key a

378. The following drugs act by inhibiting cell wall synthesis of the micro-organisms
a) Vancomycin
b) Gentamicin
c) Amphotericin B
d) Erythromycin
Key a

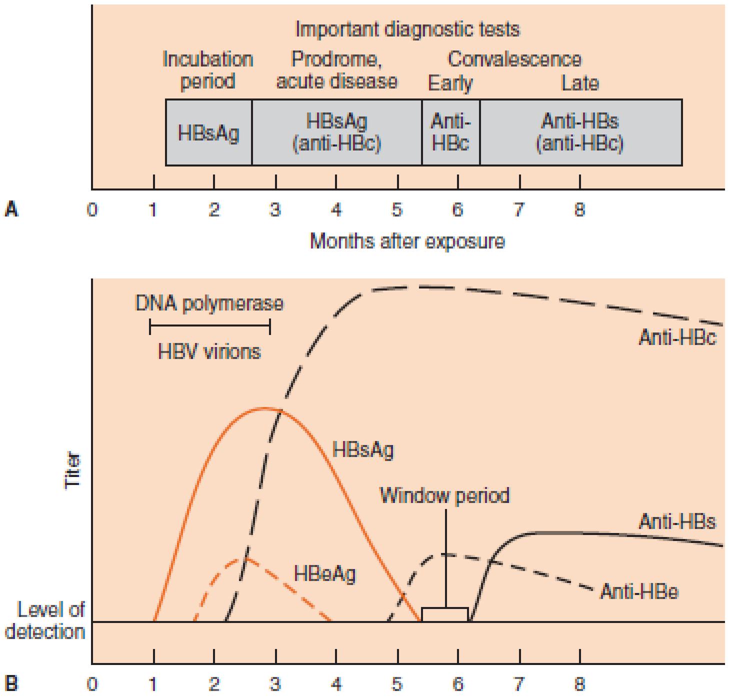
Antimicrobial therapy


FOLIC ACID SYNTHESIS AND REDUCTION (DNA methylation)
Sulfonamides
Sulfamethoxazole
Sulfadiazine
Trimethoprim
MEMBRANE INTEGRITY
Daptomycin (gram ⊕)
Polymyxins (gram ⊖)
CELL WALL SYNTHESIS
PEPTIDOGLYCAN SYNTHESIS
Glycopeptides
Vancomycin
Bacitracin
PEPTIDOGLYCAN CROSS-LINKING
Penicillinase-sensitive penicillins
Penicillin G, V
Ampicillin
Amoxicillin
Penicillinase-resistant penicillins
Oxacillin
Nafcillin
Dicloxacillin
Antipseudomonal
Piperacillin
Cephalosporins (I-V)
1st–Cefazolin, etc
2nd–Cefoxitin, etc
3rd–Ceftriaxone, etc
4th–Cefepime
5th–Ceftaroline
Carbapenems
Imipenem
Meropenem
Ertapenem
Monobactams
Aztreonam
DNA INTEGRITY (via free radicals)
Metronidazole
mRNA SYNTHESIS (RNA polymerase)
Rifampin
GYRASE
Fluoroquinolones
Ciprofloxacin
Ofloxacin
Levofloxacin
Moxifloxacin
BACTERIAL CELL
PABA
DHF
THF
DNA
RNA polymerase
DNA gyrase
mRNA
Ribosomes
50S
30S
Cell membrane
Cell wall
PROTEIN SYNTHESIS
50S SUBUNIT
Chloramphenicol
Clindamycin
Linezolid
Macrolides
Azithromycin
Clarithromycin
Erythromycin
Streptogramins
Quinupristin
Dalfopristin
30S SUBUNIT
Aminoglycosides
Gentamicin
Neomycin
Amikacin
Tobramycin
Streptomycin
Glycylcycline
Tigecycline
Tetracyclines
Tetracycline
Doxycycline
Minocycline

379. Following is true about Hepatitis B virus except

a) Is a DNA virus
b) The presence of e antigen indicates increased infectivity
c) Antibody to surface antigen usually appears within 2 weeks of infection
d) Is a recognized cause of liver cancer

Key c



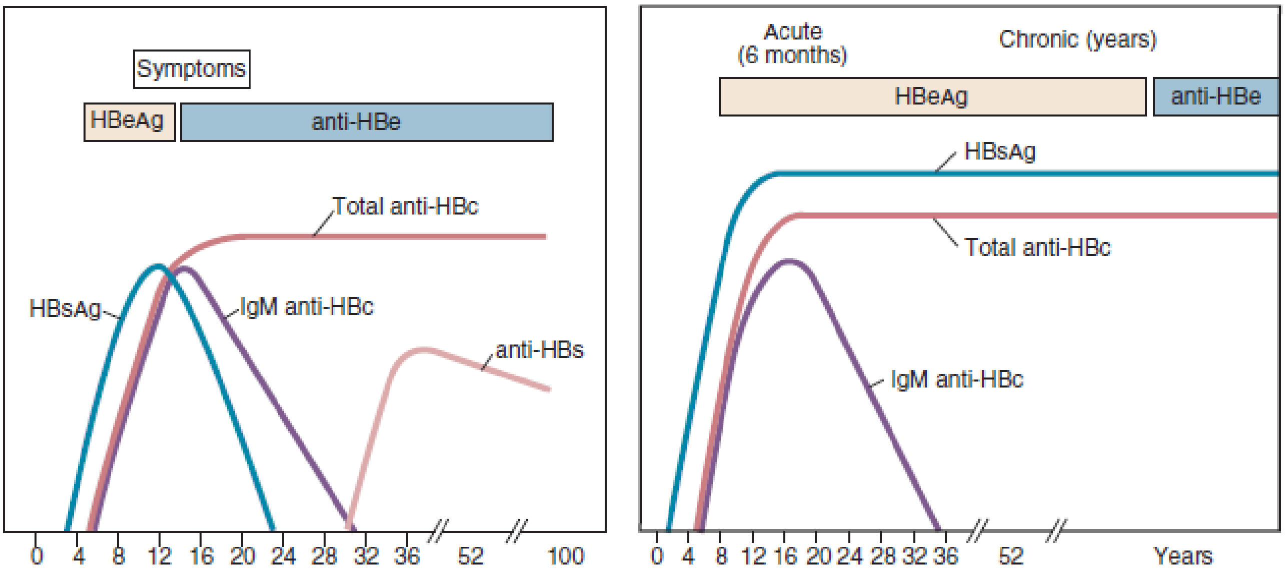


FIG. 145.7 **Typical course of hepatitis B.** *Left,* Typical course of acute hepatitis B. *Right,* Chronic hepatitis B. *HBc,* Hepatitis B core; *HBe,* hepatitis B envelope; *HBsAg,* hepatitis B surface antigen; *IgM,* immunoglobulin M.

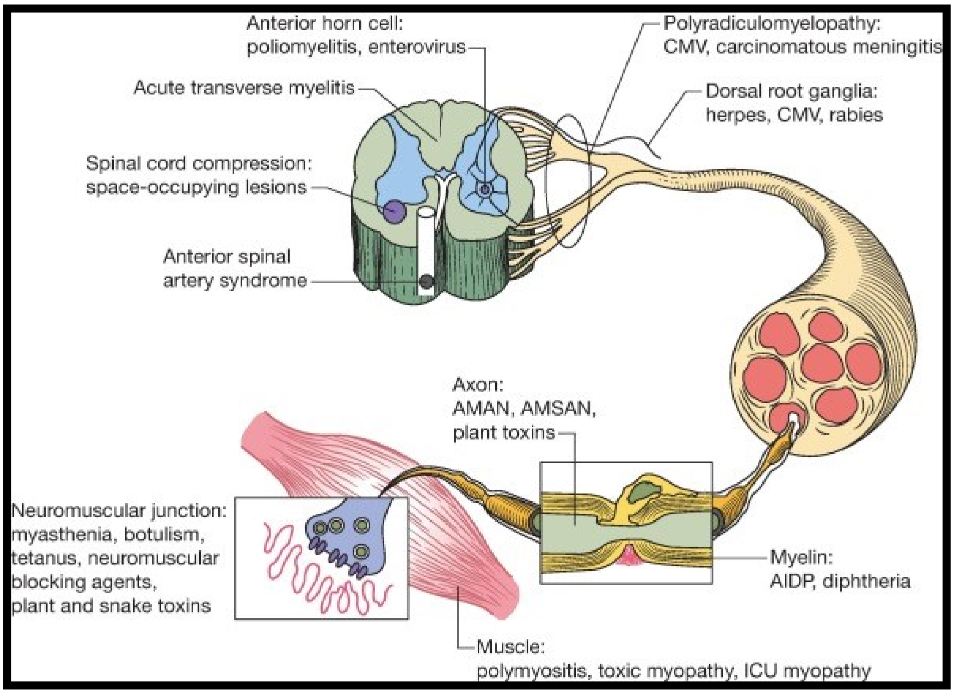
The Hepatitis B surface antibody (anti-HBs) typically appears approx 6 to 12 weeks (diff in diff books, just remember k kaafi der baa data hai HbsAg k khatam honay keh baad) after the onset of symptoms or after the resolution of acute Hepatitis B infection. This antibody marks the recovery phase and indicates immunity to the virus.

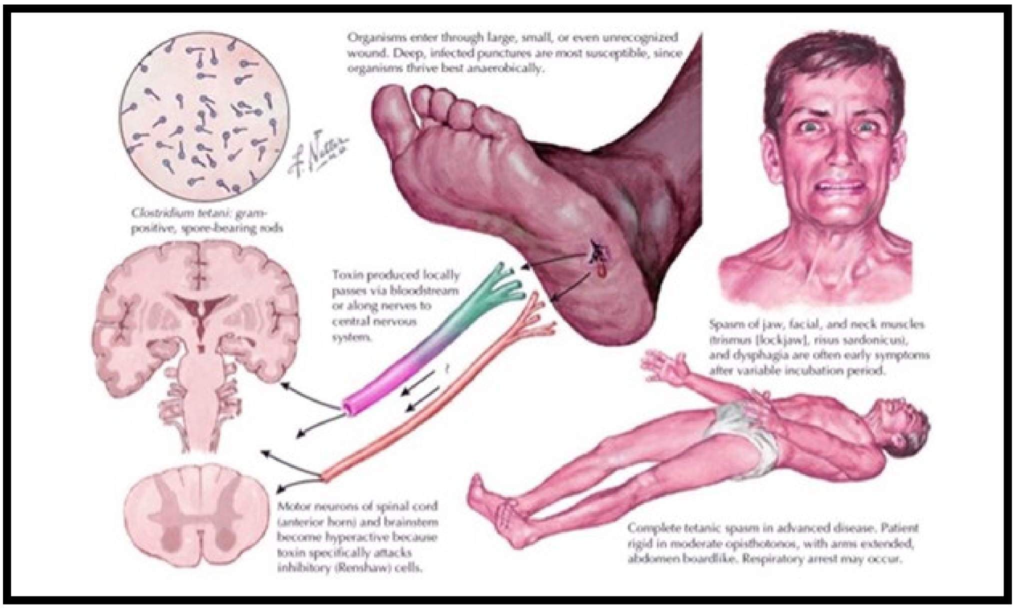
- **HBsAg : First serological marker to become detectable, 2-8 weeks after exposure**
- **HBeAg : Appears soon after HBsAg, marker of replication , infectivity, followed by rise in serum ALT and appearance of symptoms**
- **Anti- HBc IgM : First antibody which becomes apparent,soon after HBsAg, gradually declines over 3- 6 months**
- **Anti- HBc IgG : Rises with fall of anti – HBc IgM ,remains detectable for life**
- **Anti- HBe : Associated with clearance of HBeAg, appears at 4-5 months of exposure in case of sero conversion,may persist for years but titre declines**
- **Anti- HBs : Capable of neutralizing the virus, marker of disease resolution , appear a few weeks after the disappearance of HBsAg**

380. The following are true about tetanus acquired through traumatic wound ?

- a) the diagnosis is dependent on microbial findings.
- b) Clostridium tetani travels via the nerves to the anterior horn cells in the spinal cord
- c) the tetanospasmin component of the exotoxin acts on the post-synaptic neurones and prevents impulse transmission.
- d) the patient should be given antitoxin intravenously

Key CORRECT B


Anterior horn cell:
poliomyelitis, enterovirus
Polyradiculomyelopathy:
CMV, carcinomatous meningitis
Acute transverse myelitis
Dorsal root ganglia:
herpes, CMV, rabies
Spinal cord compression:
space-occupying lesions
Anterior spinal
artery syndrome
Axon:
AMAN, AMSAN,
plant toxins
Neuromuscular junction:
myasthenia, botulism,
tetanus, neuromuscular
blocking agents,
plant and snake toxins
Myelin:
AIDP, diphtheria
Muscle:
polymyositis, toxic myopathy, ICU myopathy


Organisms enter through large, small, or even unrecognized wound. Deep, infected punctures are most susceptible, since organisms thrive best anaerobically.
Clostridium tetani: gram-positive, spore-bearing rods
F. Netter
Toxin produced locally passes via bloodstream or along nerves to central nervous system.
Spasm of jaw, facial, and neck muscles (trismus [lockjaw], risus sardonicus), and dysphagia are often early symptoms after variable incubation period.
Motor neurons of spinal cord (anterior horn) and brainstem become hyperactive because toxin specifically attacks inhibitory (Renshaw) cells.
Complete tetanic spasm in advanced disease. Patient rigid in moderate opisthotonos, with arms extended, abdomen boardlike. Respiratory arrest may occur.

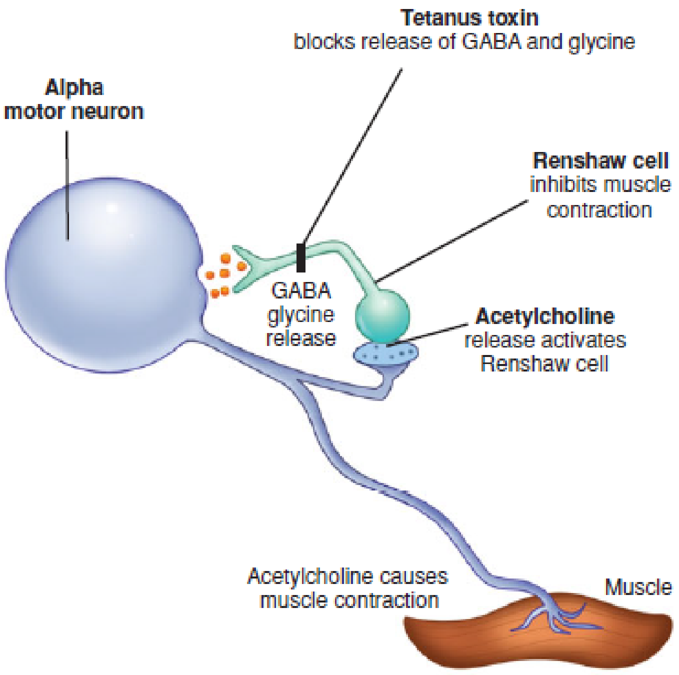

Tetanus toxin
blocks release of GABA and glycine
Alpha motor neuron
Renshaw cell
inhibits muscle contraction
GABA glycine release
Acetylcholine
release activates Renshaw cell
Acetylcholine causes muscle contraction
Muscle

Figure 8-2. The mechanism of action of tetanus toxin. Neurotransmission is controlled by the balance between excitatory (acetylcholine) and inhibitory neurotransmitters. The inhibitory neurotransmitters (i.e., GABA [γ-aminobutyric acid], glycine) prevent depolarization of the postsynaptic membrane and conduction of the electrical signal. Tetanus toxin does not interfere with production or storage of GABA or glycine, but rather with their release. In the absence of inhibitory neurotransmitters, excitation of the nerves that stimulates muscle contraction is unrestrained, resulting in contraction of both extensor and flexor muscles and spastic paralysis.

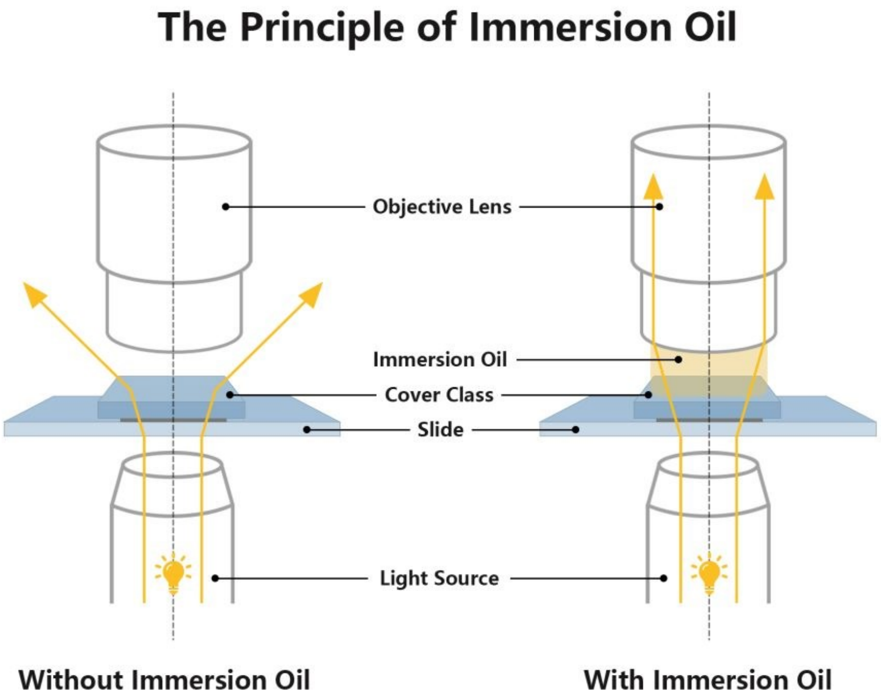
381. Penicillins were discovered by

a) Alexander fleming
b) Ehrlich
c) Thomas
d) Medawar
Key a

382. Which of the following can be used in oil immersion lens

a) Cedar wood oil
b) Glycerine
c) Liquid paraffin
d) All of the above
Key a

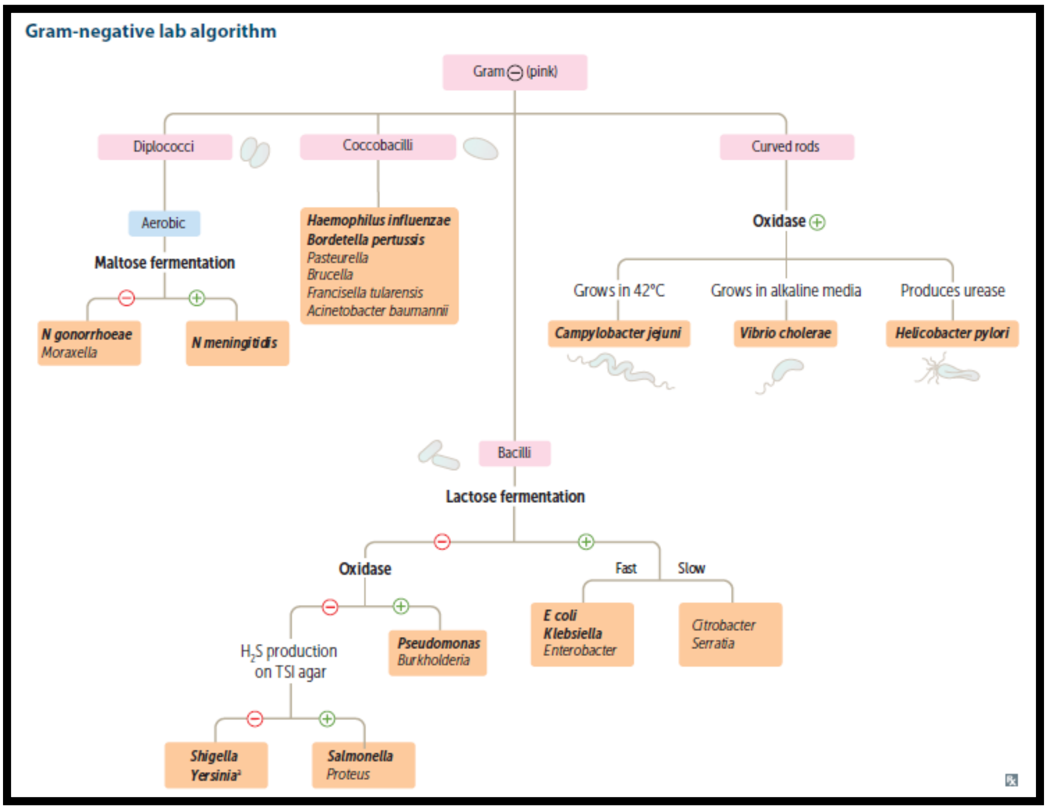
Cedarwood oil is used in oil immersion microscopy because it has a refractive index similar to that of glass, allowing for improved light transmission through the microscope's objective lens. This reduces light refraction and increases resolution, providing clearer, more detailed images at high magnifications


The Principle of Immersion Oil
Objective Lens
Immersion Oil
Cover Class
Slide
Light Source
Without Immersion Oil
With Immersion Oil

383. Which of the following are cocci

- a) Corynebacterium
- b) Neisseria
- c) Haemophilus
- d) None of these

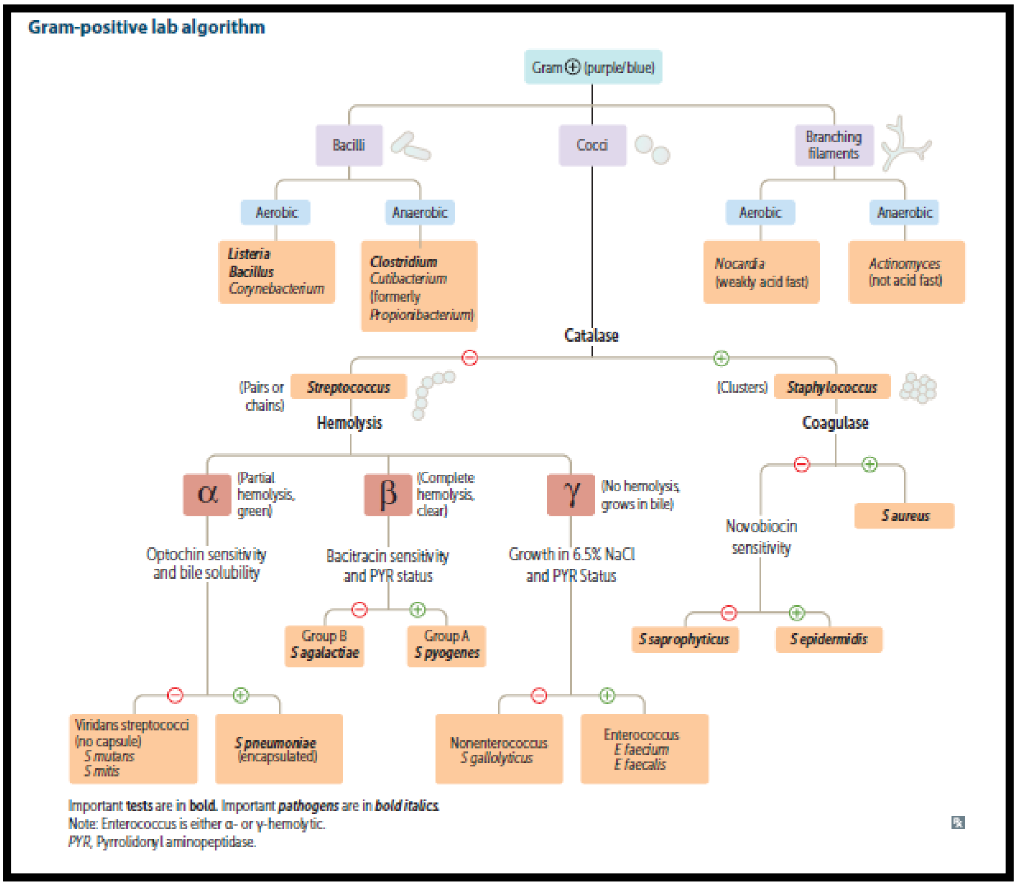
Key b


Gram-negative lab algorithm
Gram ⊖ (pink)
Diplococci
Coccobacilli
Curved rods
Aerobic
Maltose fermentation
⊖
⊕
N gonorrhoeae
Moraxella
N meningitidis
Haemophilus influenzae
Bordetella pertussis
Pasteurella
Brucella
Francisella tularensis
Acinetobacter baumannii
Oxidase ⊕
Grows in 42°C
Grows in alkaline media
Produces urease
Campylobacter jejuni
Vibrio cholerae
Helicobacter pylori
Bacilli
Lactose fermentation
⊖
⊕
Oxidase
Fast
Slow
⊖
⊕
H₂S production on TSI agar
Pseudomonas
Burkholderia
E coli
Klebsiella
Enterobacter
Citrobacter
Serratia
⊖
⊕
Shigella
Yersinia
Salmonella
Proteus

384. Which of the following is Gram Positive

- a) S. aureus
- b) Cl. Tetani

c) Corynebacterium
d) All of these
Key d



Gram-positive lab algorithm

Gram ⊕ (purple/blue)
Bacilli
Cocci
Branching filaments
Aerobic
Anaerobic
Listeria
Bacillus
Corynebacterium
Clostridium
Cutibacterium (formerly Propionibacterium)
Aerobic
Anaerobic
Nocardia (weakly acid fast)
Actinomyces (not acid fast)
Catalase
⊖
⊕
(Pairs or chains)
Streptococcus
Hemolysis
(Clusters)
Staphylococcus
Coagulase
α
(Partial hemolysis, green)
β
(Complete hemolysis, clear)
γ
(No hemolysis, grows in bile)
⊖
⊕
S aureus
Novobiocin sensitivity
Optochin sensitivity and bile solubility
Bacitracin sensitivity and PYR status
Growth in 6.5% NaCl and PYR Status
⊖
⊕
Group B S agalactiae
Group A S pyogenes
⊖
⊕
S saprophyticus
S epidermidis
⊖
⊕
Viridans streptococci (no capsule) S mutans S mitis
S pneumoniae (encapsulated)
⊖
⊕
Nonenterococcus S gallolyticus
Enterococcus E faecium E faecalis

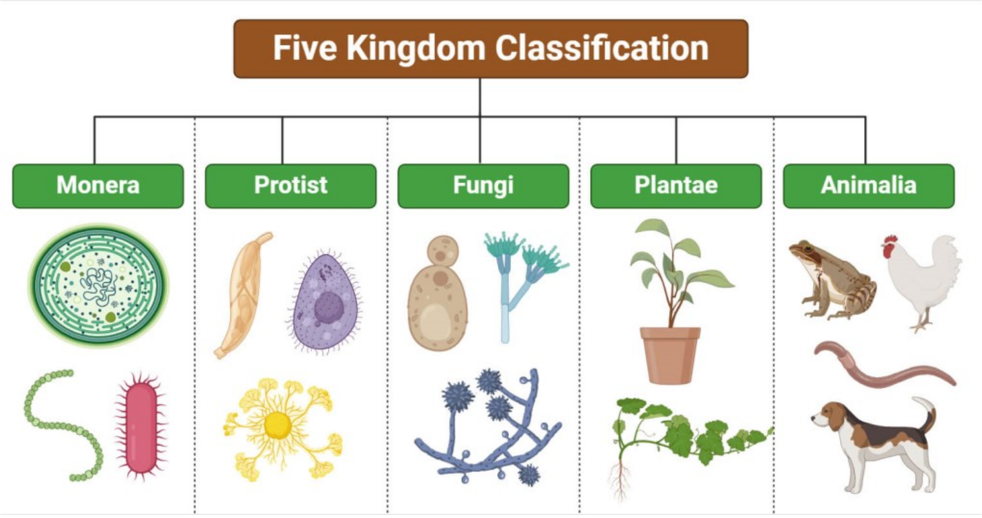
Important **tests** are in **bold**. Important ***pathogens*** are in ***bold italics***.
Note: Enterococcus is either α- or γ-hemolytic.
PYR, Pyrrolidonyl aminopeptidase.

385. Which of the following microscope possess high resolution
a) compound microscope
b) UV microscope
c) Dark field microscope
d) Dissecting microscope
Key b

Characteristics of UV Microscope

1. **High resolution: UV microscopes use ultraviolet light, allowing for higher resolution and more detailed observations.**
2. **Enhanced contrast: UV light helps visualize specimens with low contrast.**

386. Micro-organisms are classified under
a) Plant kingdom
b) Animal kingdom
c) Protista
d) All of these
Key c


Five Kingdom Classification
Monera
Protist
Fungi
Plantae
Animalia

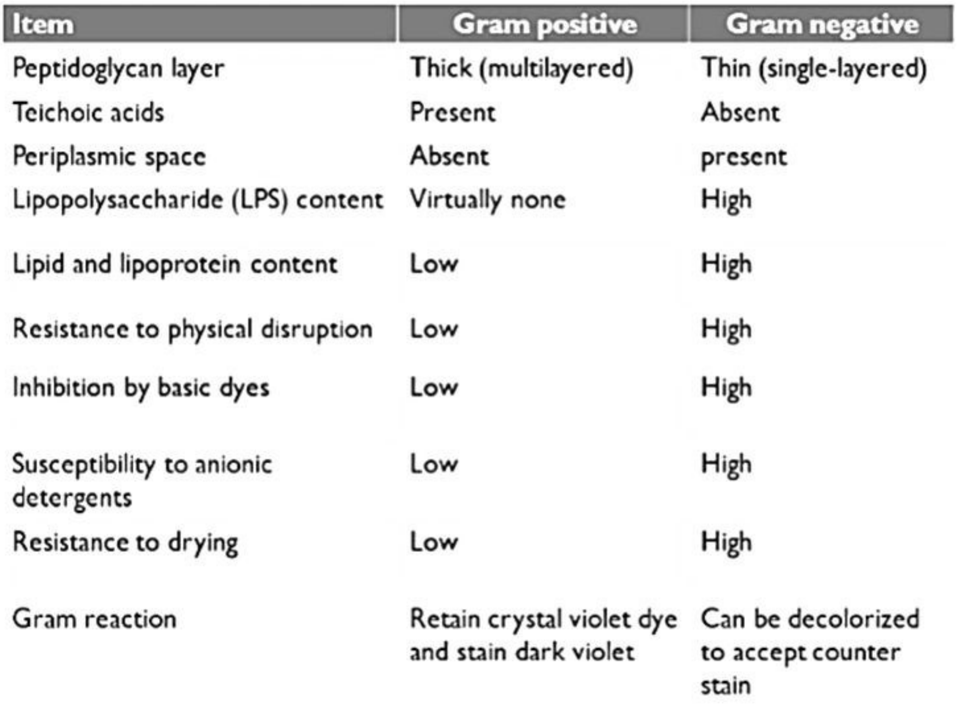
Five Kingdoms

- **Monera: Unicellular prokaryotes i.e. bacteria**
- **Protista: Unicellular or simple multicellular eukaryotes, including protozoa, algae, and slime molds.**
- **Fungi: Yeasts / Molds**
- **Plantae: Multicellular, photosynthetic organisms, including mosses, ferns, conifers, and flowering plants.**
- **Animalia: Multicellular, heterotrophic organisms, including invertebrates (e.g., insects, worms) and vertebrates**

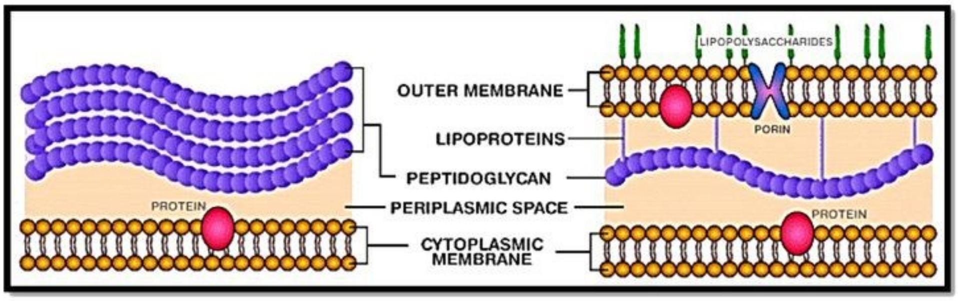
387. Which of the following is a major constituent of gram-negative cell wall

a) Protein
b) Lipopolysaccharide
c) Peptidoglycan
d) Teichoic acid

Key b



Item	Gram positive	Gram negative
Peptidoglycan layer	Thick (multilayered)	Thin (single-layered)
Teichoic acids	Present	Absent
Periplasmic space	Absent	present
Lipopolysaccharide (LPS) content	Virtually none	High
Lipid and lipoprotein content	Low	High
Resistance to physical disruption	Low	High
Inhibition by basic dyes	Low	High
Susceptibility to anionic detergents	Low	High
Resistance to drying	Low	High
Gram reaction	Retain crystal violet dye and stain dark violet	Can be decolorized to accept counter stain

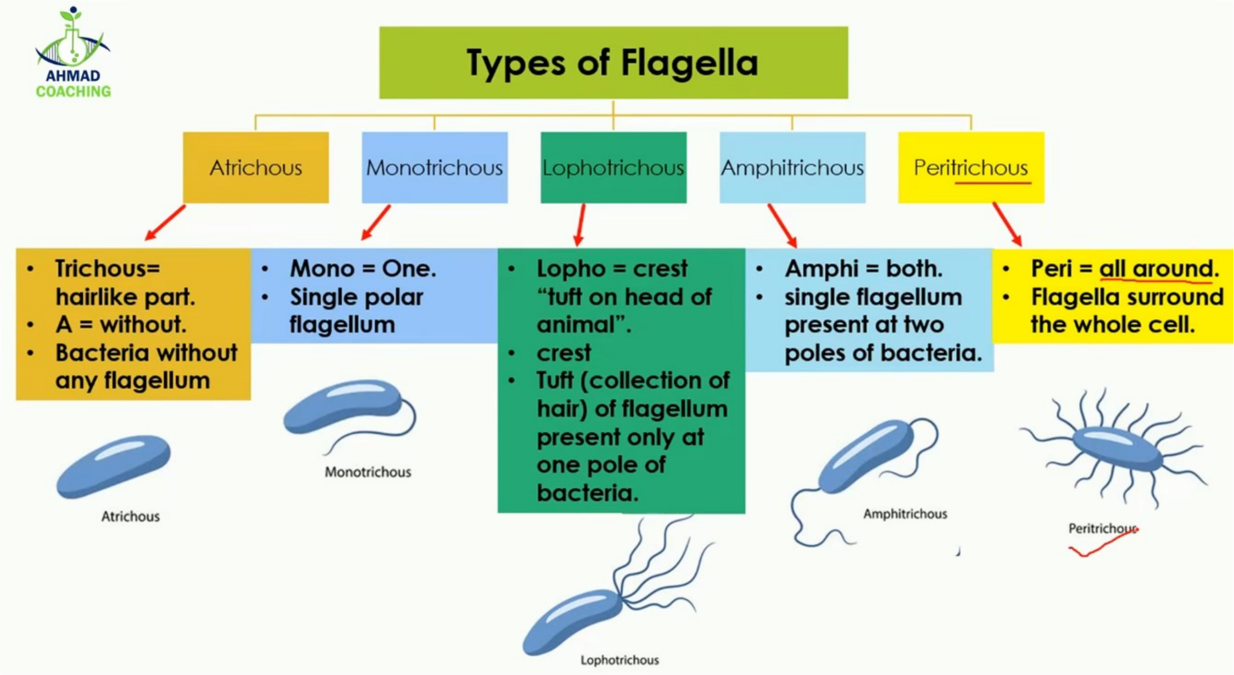

LIPOPOLYSACCHARIDES
OUTER MEMBRANE
PORIN
LIPOPROTEINS
PEPTIDOGLYCAN
PROTEIN
PERIPLASMIC SPACE
PROTEIN
CYTOPLASMIC MEMBRANE

Gram-positive bacteria Gram negative bacteria

388. Lophotrichous type of arrangement in bacteria means

- a) flagella at both ends
- b) tuft of flagella
- c) flagella all around the cell
- d) None of these

Key b



Types of Flagella

Atrichous
- Trichous= hairlike part.
- A = without.
- Bacteria without any flagellum

Monotrichous
- Mono = One.
- Single polar flagellum

Lophotrichous
- Lopho = crest "tuft on head of animal".
- crest
- Tuft (collection of hair) of flagellum present only at one pole of bacteria.

Amphitrichous
- Amphi = both.
- single flagellum present at two poles of bacteria.

Peritrichous
- Peri = all around.
- Flagella surround the whole cell.

☐ **Monotrichous**:
- **Single flagellum** at one pole of the bacterium.
- Example: *Vibrio cholerae* (causes cholera).

☐ **Lophotrichous**:
- **Tufts of flagella** at one or both poles.
- Example: *Pseudomonas aeruginosa* and *Helicobacter pylori*

☐ **Amphitrichous**:
- **A single flagellum at each pole** of the bacterium.
- Example: *Spirillum volutans* (a spiral-shaped bacterium).

☐ **Peritrichous**:
- **Flagella distributed over the entire surface** of the bacterium.
- Example: *Escherichia coli* (a common intestinal bacterium).

☐ **Atrichous**:
- **No flagella**.
- Example: *Shigella dysenteriae* (causes dysentery).

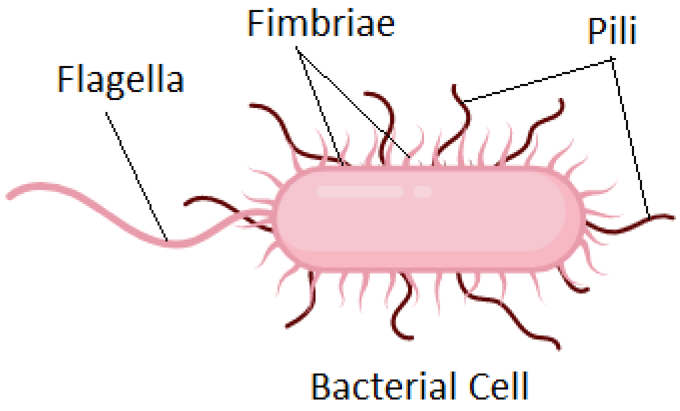
389. Fimbriae are absent in

a) Gram positive
b) Gram negative
c) both of these
d) None of these

Key a (NOT A GOOD QUALITY MCQ)

Explanation:

- **Fimbriae are hair-like appendages on the surface of bacteria that help in attachment to surfaces, tissues, or other cells. They are typically found in Gram-negative bacteria.**
- **Gram-positive bacteria generally lack fimbriae and instead may have other surface structures such as teichoic acids for attachment.**


Fimbriae
Pili
Flagella
Bacterial Cell

390. Which of the following bacteria form spores

- a) C. diphtheria
- b) Cl. Perfringens
- c) N. gonorrhea
- d) Klebsiella

Key b

391. Which of the following bacteria cell possess metachromatic granules

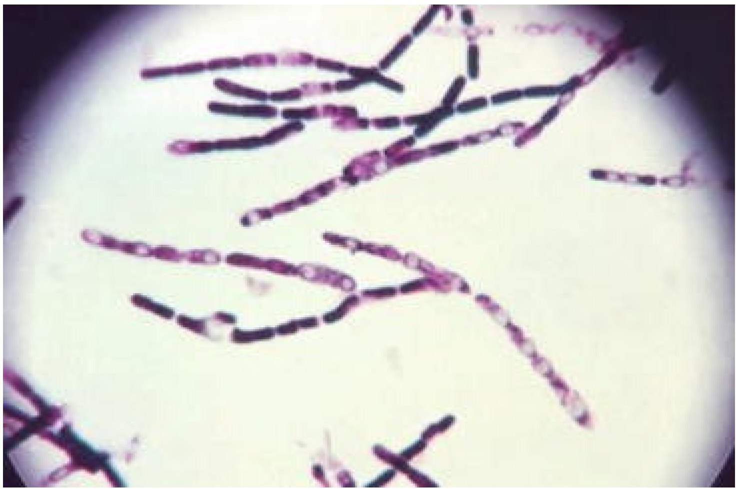
- a) Corynebacterium
- b) Clostridium
- c) Mycobacterium
- d) All of these

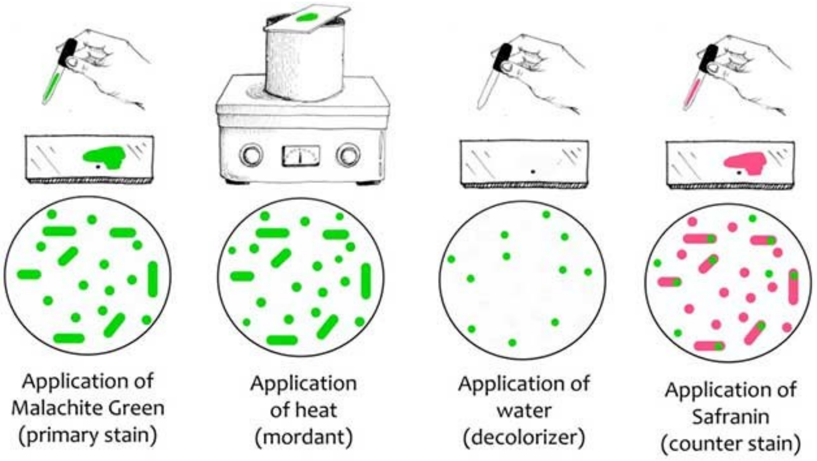
Key a

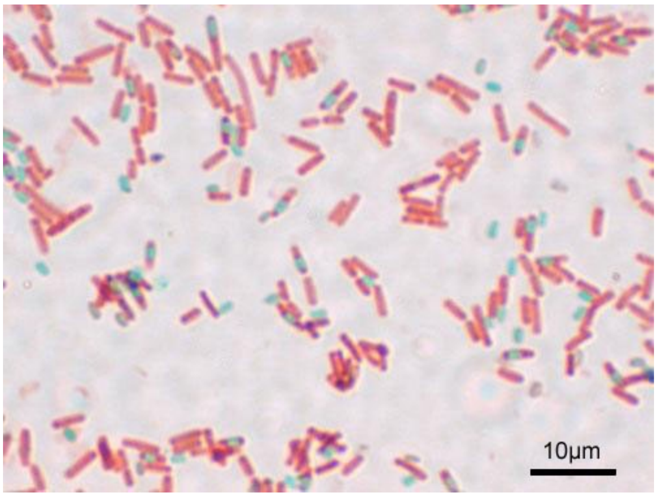
392. In gram staining bacterial spores may be seen as

- a) Colourless
- b) Voilet
- c) Green
- d) None of these

Key a




Application of
Malachite Green
(primary stain)
Application
of heat
(mordant)
Application of
water
(decolorizer)
Application of
Safranin
(counter stain)



393. Which of the following type of ribosome are present in bacteria

a) 80S
b) 70S
c) 90S
d) None of these

Key b

394. Number of chromosome in bacteria is

a) 1
b) 2
c) 5
d) None of these

Key A

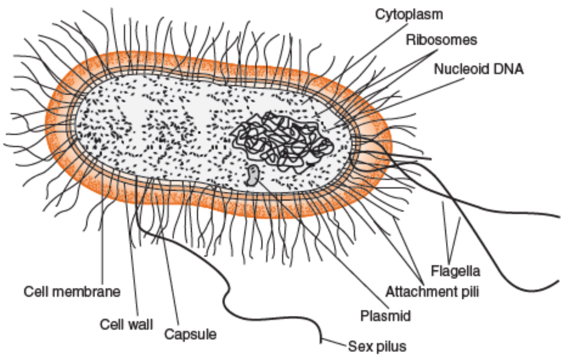
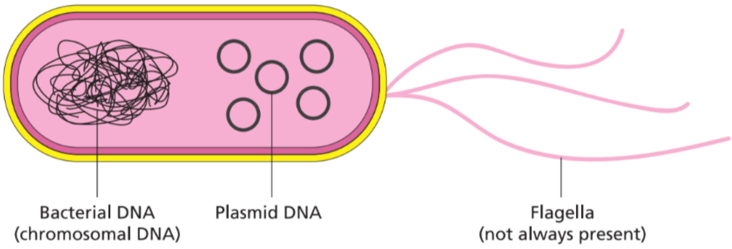

Cytoplasm
Ribosomes
Nucleoid DNA
Flagella
Attachment pili
Plasmid
Sex pilus
Cell membrane
Cell wall
Capsule

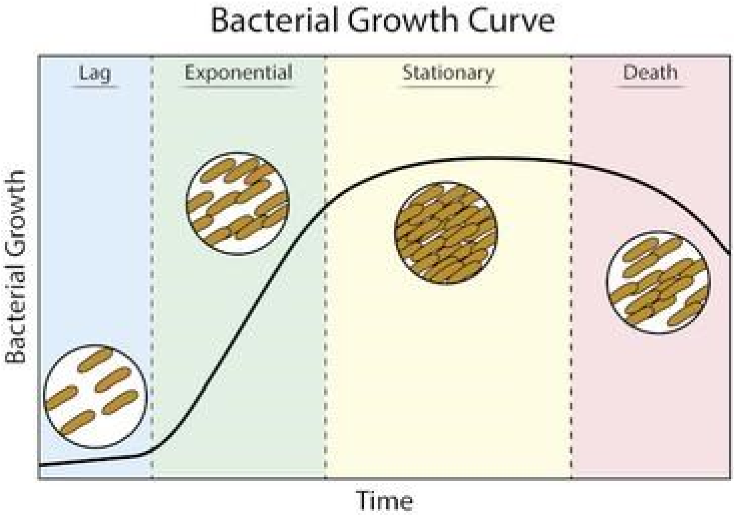
FIGURE 2–3 Bacterial structure. (Reproduced with permission from Ryan K et al. *Sherris Medical Microbiology*. 4th ed. Copyright 2004, McGraw-Hill.)


Bacterial DNA
(chromosomal DNA)
Plasmid DNA
Flagella
(not always present)

395. Sporulation of bacteria occurs in

a) Stationary phase
b) Log phase
c) Lag phase
d) All of the above
Key a

Sporulation in bacteria typically occurs during the stationary phase of growth, when nutrients are exhausted and waste products accumulate. Under these stressful conditions, certain bacteria (such as *Bacillus* and *Clostridium*) form spores to survive harsh environments.



396. Optimum temperature for most pathogenic bacteria is

a) 47 ^{0}C
b) 42 ^{0}C
c) 37 ^{0} C
d) None of these
Key c

397. Bacteria which can grow in absence of oxygen are known as

a) Strict aerobes
b) Anaerobes
c) Microaerophilic
d) None of these
Key b

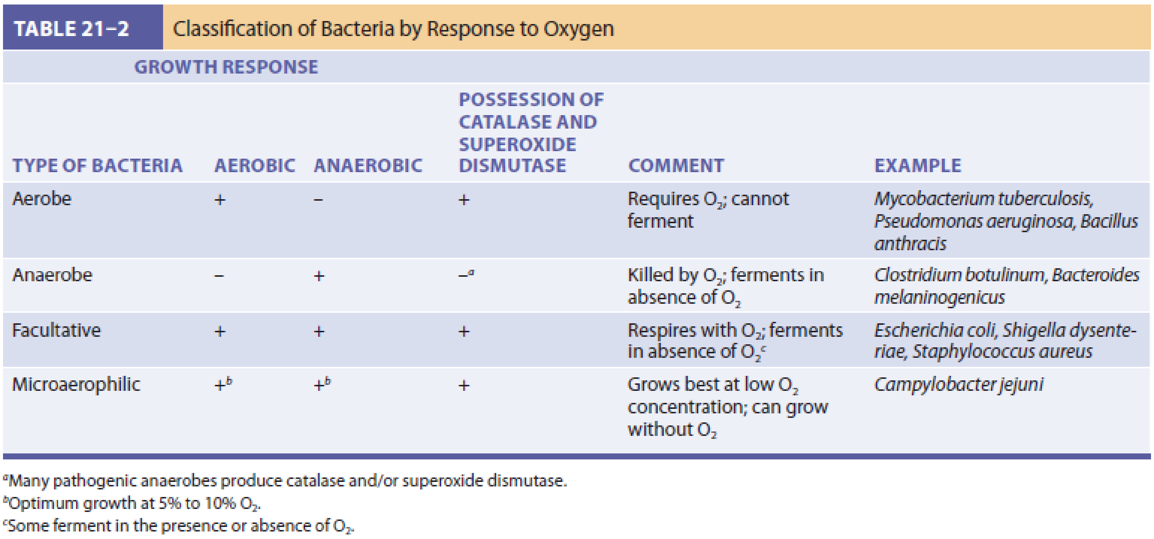


TABLE 21–2 Classification of Bacteria by Response to Oxygen

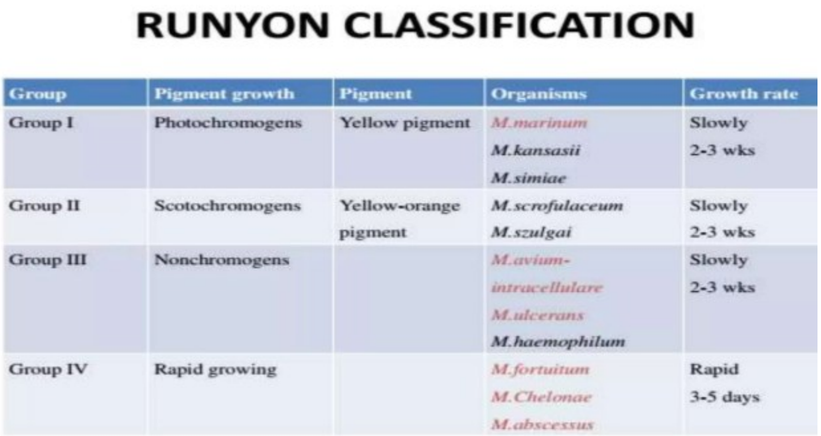
TYPE OF BACTERIA	GROWTH RESPONSE AEROBIC	ANAEROBIC	POSSESSION OF CATALASE AND SUPEROXIDE DISMUTASE	COMMENT	EXAMPLE
Aerobe	+	–	+	Requires O_2; cannot ferment	*Mycobacterium tuberculosis, Pseudomonas aeruginosa, Bacillus anthracis*
Anaerobe	–	+	–[a]	Killed by O_2; ferments in absence of O_2	*Clostridium botulinum, Bacteroides melaninogenicus*
Facultative	+	+	+	Respires with O_2; ferments in absence of O_2[c]	*Escherichia coli, Shigella dysenteriae, Staphylococcus aureus*
Microaerophilic	+[b]	+[b]	+	Grows best at low O_2 concentration; can grow without O_2	*Campylobacter jejuni*

[a] Many pathogenic anaerobes produce catalase and/or superoxide dismutase.
[b] Optimum growth at 5% to 10% O_2.
[c] Some ferment in the presence or absence of O_2.

- ☐ **Obligate aerobes need oxygen for survival.**
- ☐ **Obligate anaerobes are harmed by oxygen.**
- ☐ **Facultative anaerobes can adapt to either condition.**
- ☐ **Microaerophiles require low oxygen levels.**
- ☐ **Aerotolerant anaerobes can tolerate oxygen but don't use it.**

398. Which of the following bacteria can grow in acidic pH
a) Escherichia
b) vibrio
c) Lactobacilli
d) Klebsiella
Key c

399. Which of the following bacteria is photochromogenic
a) Mycobacteria
b) pseudomonas
c) Staphylococci
d) Escherichia
Key (CORRECTED = A)



RUNYON CLASSIFICATION

Group	Pigment growth	Pigment	Organisms	Growth rate
Group I	Photochromogens	Yellow pigment	*M.marinum* *M.kansasii* *M.simiae*	Slowly 2-3 wks
Group II	Scotochromogens	Yellow-orange pigment	*M.scrofulaceum* *M.szulgai*	Slowly 2-3 wks
Group III	Nonchromogens		*M.avium-intracellulare* *M.ulcerans* *M.haemophilum*	Slowly 2-3 wks
Group IV	Rapid growing		*M.fortuitum* *M.Chelonae* *M.abscessus*	Rapid 3-5 days

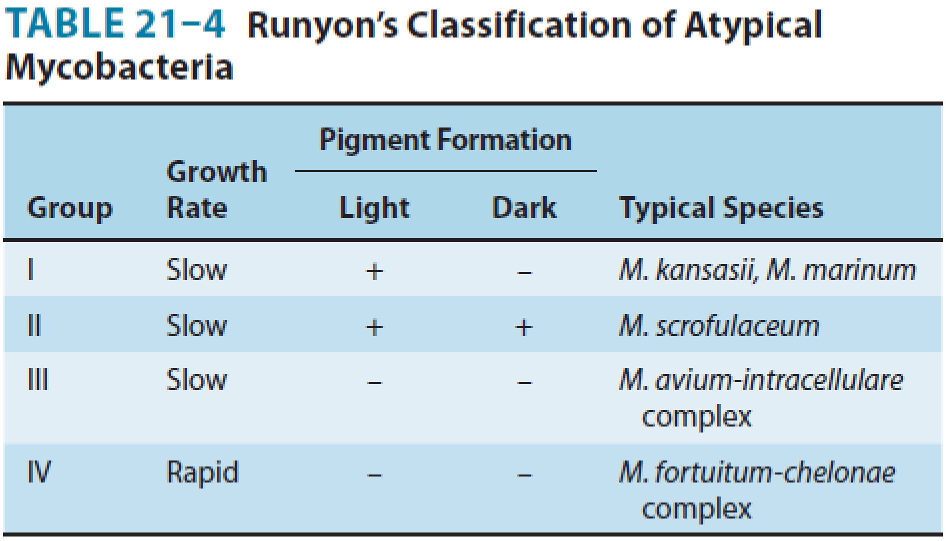


TABLE 21–4 **Runyon's Classification of Atypical Mycobacteria**

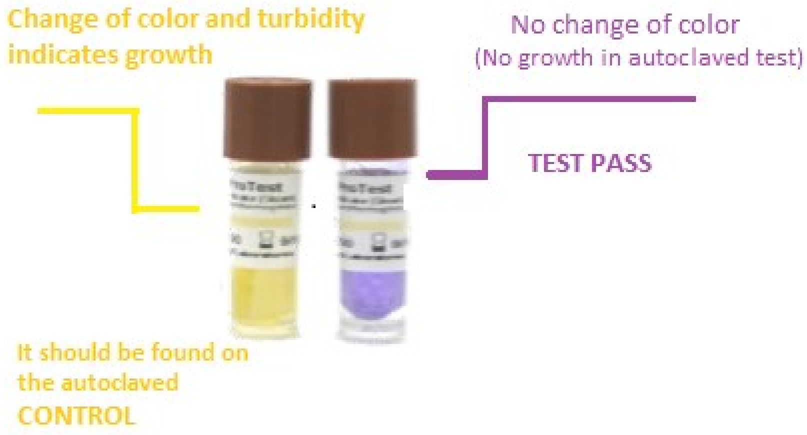
Group	Growth Rate	Pigment Formation		Typical Species
		Light	Dark	
I	Slow	+	–	*M. kansasii, M. marinum*
II	Slow	+	+	*M. scrofulaceum*
III	Slow	–	–	*M. avium-intracellulare* complex
IV	Rapid	–	–	*M. fortuitum-chelonae* complex

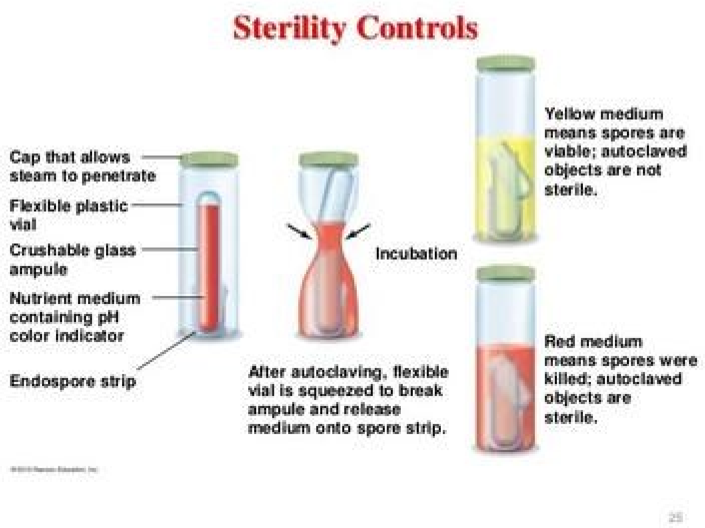
400. Moist heat under pressure is called

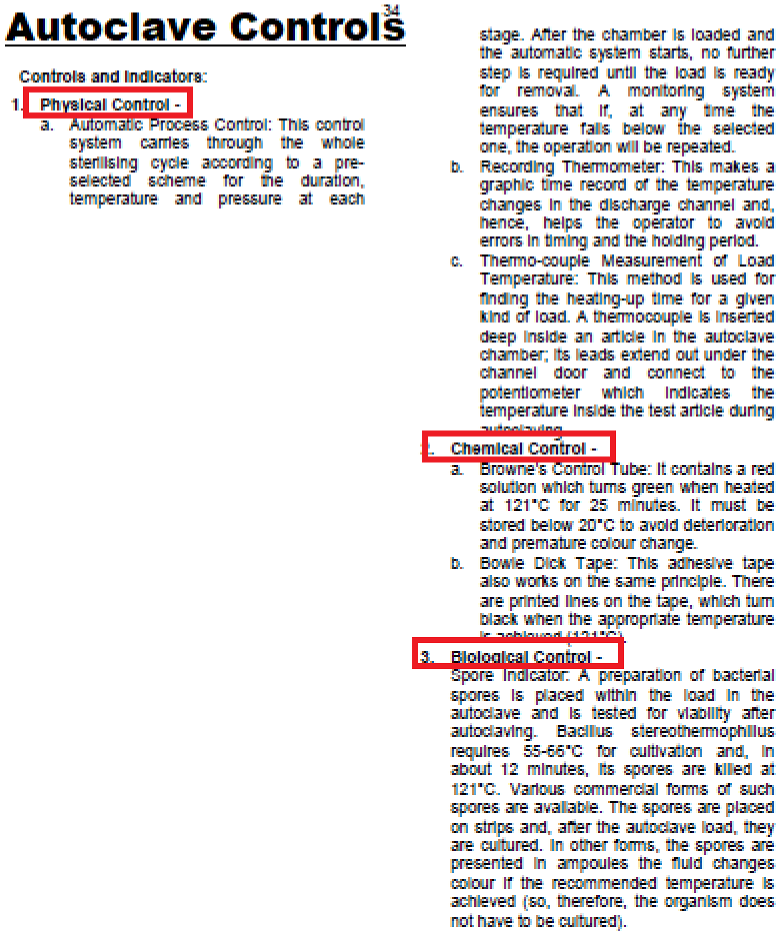
a) Pasteruization
b) Tyndallization (killing heat resistant endospores)
c) Autoclave
d) Inspissation
Key c

401. Biological indicator used in hot air oven is

a) Bacillus stearothermophilus
b) B. subtilis
c) both of these
d) None of these
Key a


Change of color and turbidity indicates growth
No change of color
(No growth in autoclaved test)
TEST PASS
It should be found on the autoclaved CONTROL


Sterility Controls
Cap that allows steam to penetrate
Flexible plastic vial
Crushable glass ampule
Nutrient medium containing pH color indicator
Endospore strip
Incubation
After autoclaving, flexible vial is squeezed to break ampule and release medium onto spore strip.
Yellow medium means spores are viable; autoclaved objects are not sterile.
Red medium means spores were killed; autoclaved objects are sterile.
25



Autoclave Controls[34]

Controls and Indicators:

1. **Physical Control -**
   a. Automatic Process Control: This control system carries through the whole sterilising cycle according to a pre-selected scheme for the duration, temperature and pressure at each stage. After the chamber is loaded and the automatic system starts, no further step is required until the load is ready for removal. A monitoring system ensures that if, at any time the temperature falls below the selected one, the operation will be repeated.
   b. Recording Thermometer: This makes a graphic time record of the temperature changes in the discharge channel and, hence, helps the operator to avoid errors in timing and the holding period.
   c. Thermo-couple Measurement of Load Temperature: This method is used for finding the heating-up time for a given kind of load. A thermocouple is inserted deep inside an article in the autoclave chamber; its leads extend out under the channel door and connect to the potentiometer which indicates the temperature inside the test article during autoclaving.
2. **Chemical Control -**
   a. Browne's Control Tube: It contains a red solution which turns green when heated at 121°C for 25 minutes. It must be stored below 20°C to avoid deterioration and premature colour change.
   b. Bowie Dick Tape: This adhesive tape also works on the same principle. There are printed lines on the tape, which turn black when the appropriate temperature is achieved (121°C).
3. **Biological Control -**
   Spore Indicator: A preparation of bacterial spores is placed within the load in the autoclave and is tested for viability after autoclaving. Bacillus stereothermophilus requires 55-66°C for cultivation and, in about 12 minutes, its spores are killed at 121°C. Various commercial forms of such spores are available. The spores are placed on strips and, after the autoclave load, they are cultured. In other forms, the spores are presented in ampoules the fluid changes colour if the recommended temperature is achieved (so, therefore, the organism does not have to be cultured).

402. Blood agar is

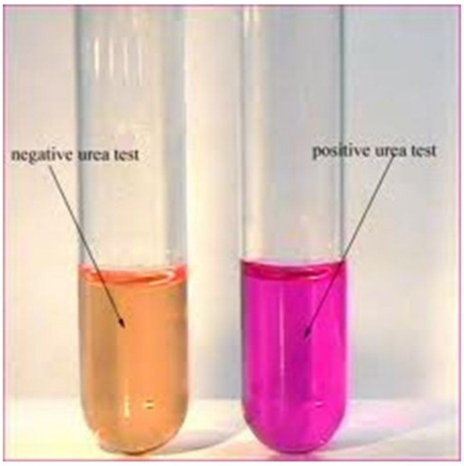
a) Enriched media
b) Enrichment media
c) Differential media
d) Both A and C
Key d (CONFIRMED D)

403. Which of the following is basic constituent of culture media

a) Peptone
b) Meat extract
c) Yeast extract
d) All of the above
Key d

404. Which of the following indicator is used in Christensen’s Urea medium

a) Neutral Red
b) Phenol red
c) Methyl red
d) Congo red
Key b



Urease Test

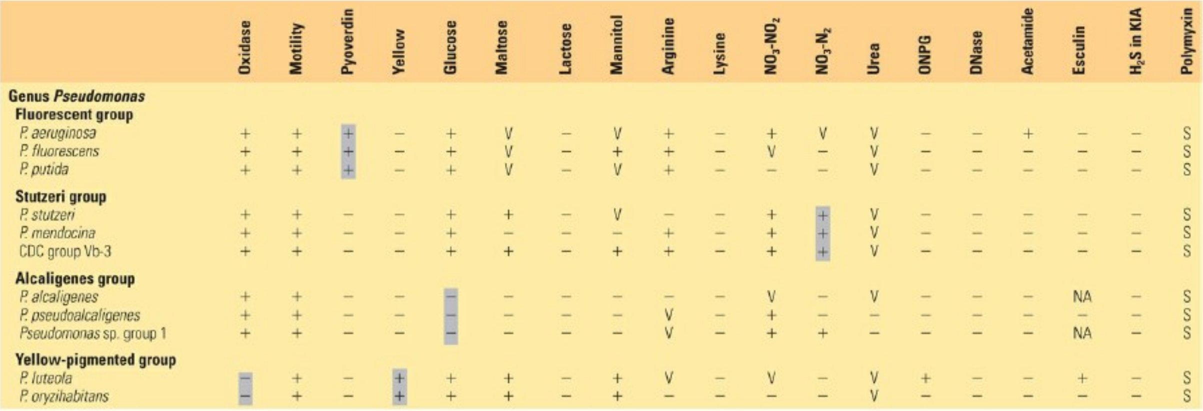
The test organism is cultured in a medium which contains urea and the indicator phenol red.

When the strain is urease producing, the enzyme will break down the urea (by hydrolysis) to give ammonia and carbon dioxide. With the release of ammonia, the medium becomes alkaline as shown by a change in colour of the indicator to pink-red.

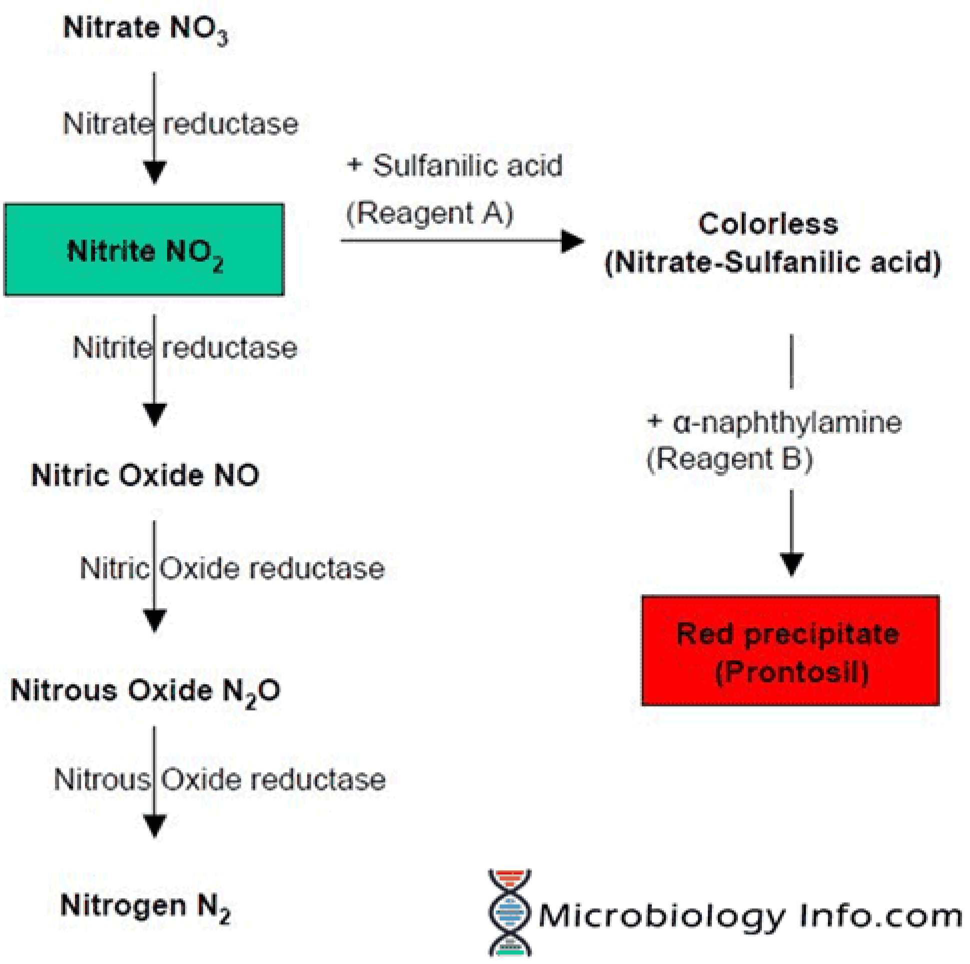
405. Following bacteria reduces nitrates except

a) V. cholera
b) E. coli
c) P. aeruginosa
d) All of the above
Key = ALL OF THEM REDUCE NITRATE TO NITRITE AS EVIDENCED BELOW REFERENCE KONEMANS TEXTBOOK!!! But if this MCQ comes in the exam then choose Pseudomonas

TABLE 7-4 Key Characteristics of Pseudomonads



	Oxidase	Motility	Pyoverdin	Yellow	Glucose	Maltose	Lactose	Mannitol	Arginine	Lysine	NO_3-NO_2	NO_3-N_2	Urea	ONPG	DNase	Acetamide	Esculin	H_2S in KIA	Polymyxin
Genus *Pseudomonas*																			
Fluorescent group																			
P. aeruginosa	+	+	+	−	+	V	−	V	+	−	+	V	V	−	−	+	−	−	S
P. fluorescens	+	+	+	−	+	V	−	+	+	−	V	−	V	−	−	−	−	−	S
P. putida	+	+	+	−	+	V	−	V	+	−	−	−	V	−	−	−	−	−	S
Stutzeri group																			
P. stutzeri	+	+	−	−	+	+	−	V	−	−	+	+	V	−	−	−	−	−	S
P. mendocina	+	+	−	−	+	−	−	−	+	−	+	+	V	−	−	−	−	−	S
CDC group Vb-3	+	+	−	−	+	+	−	+	+	−	+	+	V	−	−	−	−	−	S
Alcaligenes group																			
P. alcaligenes	+	+	−	−	−	−	−	−	−	−	V	−	V	−	−	−	NA	−	S
P. pseudoalcaligenes	+	+	−	−	−	−	−	−	V	−	+	−	−	−	−	−	−	−	S
Pseudomonas sp. group 1	+	+	−	−	−	−	−	−	V	−	+	+	−	−	−	−	NA	−	S
Yellow-pigmented group																			
P. luteola	−	+	−	+	+	+	−	+	V	−	V	−	V	+	−	−	+	−	S
P. oryzihabitans	−	+	−	+	+	+	−	+	−	−	−	−	V	−	−	−	−	−	S


Nitrate NO3
Nitrate reductase
Nitrite NO2
+ Sulfanilic acid
(Reagent A)
Colorless
(Nitrate-Sulfanilic acid)
Nitrite reductase
+ α-naphthylamine
(Reagent B)
Nitric Oxide NO
Nitric Oxide reductase
Red precipitate
(Prontosil)
Nitrous Oxide N2O
Nitrous Oxide reductase
Nitrogen N2
Microbiology Info.com

406. Mutation of gene occurs in
- a) deletion
- b) addition
- c) substitution
- d) All of above

Key d

407. Following are Zoonotic disease except
- a) Tetanus
- b) Rabies
- c) Hydatid disease
- d) Toxoplasmosis

Key a

408. Following are transmitted by sexual contact
- a) Gonorrhea
- b) Syphillis
- c) Soft sore
- d) All of above

Key d

409. Which of the following disease is not acquired by ingestion
- a) Salmonellosis
- b) Diphtheria
- c) Cholera
- d) Shigellosis

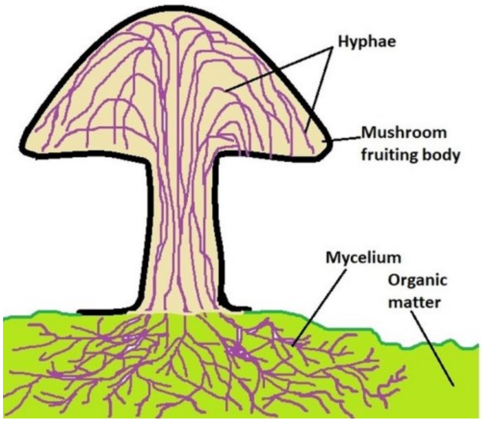
Key b

410. In which of the following condition normal flora becomes pathogenic
- a) Diabetes

b) Leukemia
c) AIDs
d) All of the above
Key d

411. Attenuation is
a) Increase in virulence
b) Decrease in virulence
c) Increase in antigenicity
d) decrease in antigenicity
Key CORRECTED = B

412. Microbes that live on dead and decaying organic material are known as:
a) indigenous microflora
b) Parasites
c) Pathogens
d) Saprophytes
Key d



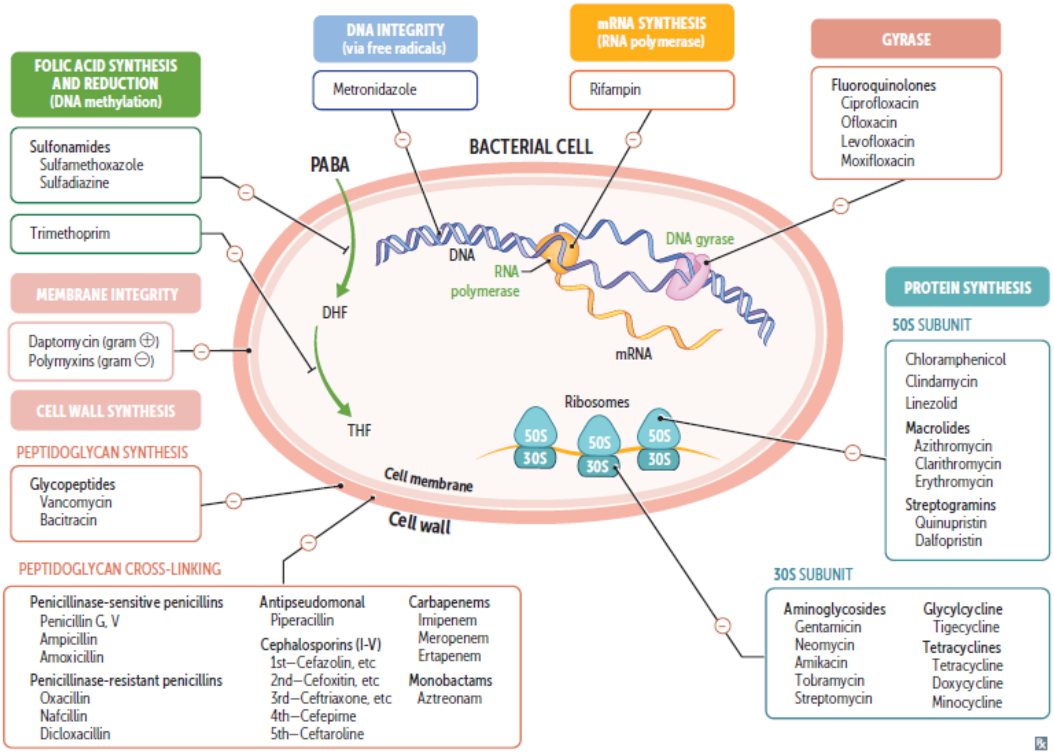
413. Of the following, which one is not found in prokaryotic cells?
a) Cell membrane
b) Chromosome
c) Mitochondria
d) Plasmids
Key c (PLEASE CONFIRM) yes C >B

414. At the end of the Gram staining procedure, Gram-positive bacteria will be:
a) Blue to purple
b) Green
c) Orange
d) Pink to red
Key a

415. Which of the following of the building blocks of proteins?
a) Amino acids
b) Monosaccharides
c) Nucleotides
d) Peptides
Key a

416. All the following antimicrobial agents work by inhibiting cell wall synthesis except:
a) Cephalosporins
b) Chloramphenicol
c) Penicillin
d) Vancomycin

Key b



Antimicrobial therapy

FOLIC ACID SYNTHESIS AND REDUCTION (DNA methylation)
Sulfonamides
Sulfamethoxazole
Sulfadiazine
Trimethoprim
MEMBRANE INTEGRITY
Daptomycin (gram ⊕)
Polymyxins (gram ⊖)
CELL WALL SYNTHESIS
PEPTIDOGLYCAN SYNTHESIS
Glycopeptides
Vancomycin
Bacitracin
PEPTIDOGLYCAN CROSS-LINKING
Penicillinase-sensitive penicillins
Penicillin G, V
Ampicillin
Amoxicillin
Penicillinase-resistant penicillins
Oxacillin
Nafcillin
Dicloxacillin
Antipseudomonal
Piperacillin
Cephalosporins (I-V)
1st–Cefazolin, etc
2nd–Cefoxitin, etc
3rd–Ceftriaxone, etc
4th–Cefepime
5th–Ceftaroline
Carbapenems
Imipenem
Meropenem
Ertapenem
Monobactams
Aztreonam
DNA INTEGRITY (via free radicals)
Metronidazole
mRNA SYNTHESIS (RNA polymerase)
Rifampin
GYRASE
Fluoroquinolones
Ciprofloxacin
Ofloxacin
Levofloxacin
Moxifloxacin
BACTERIAL CELL
PABA
DHF
THF
DNA
RNA polymerase
DNA gyrase
mRNA
Ribosomes
50S
30S
Cell membrane
Cell wall
PROTEIN SYNTHESIS
50S SUBUNIT
Chloramphenicol
Clindamycin
Linezolid
Macrolides
Azithromycin
Clarithromycin
Erythromycin
Streptogramins
Quinupristin
Dalfopristin
30S SUBUNIT
Aminoglycosides
Gentamicin
Neomycin
Amikacin
Tobramycin
Streptomycin
Glycylcycline
Tigecycline
Tetracyclines
Tetracycline
Doxycycline
Minocycline

417. Which of the following sites of the human body does not have indigenous microflora?

a) Bloodstream
b) Colon
c) Distal urethra
d) Vagina

Key a

418. Which of the following would be present in highest numbers in the indigenous microflora of the skin?

a) C. albicans
b) Coagulase-negative staphylococci
c) Enterococcus spp
d) E.coli

Key b

419. Sterilization

a) Means freeing of an article from organisms and their spores
b) Of catheters and syringes is done by washing with Lysol
c) Is done by Hot air balloon
d) Can be done by washing with soap for 30 minutes

Key a

420. In autoclave

a) Moist heat at temperature above 100ºC is provided
b) 121ºC for 15 min is required for autoclaving
c) Majority of culture media are sterilized by autoclaving
d) All of above

Key b

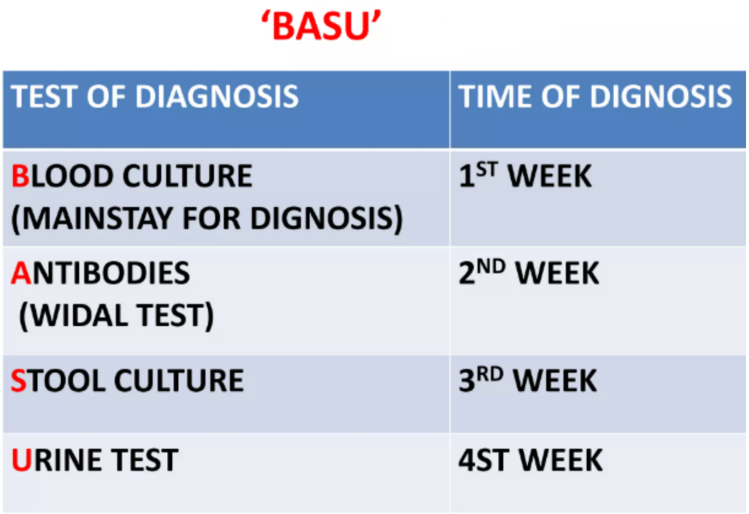
421. Strict Anaerobic bacteria

a) Requires small amount of O_2 for their growth
b) Only grow in presence of small amount of C O_2 and O_2 for their growth

c) Can only grow in the absence of oxygen
d) Need small amount of N O_2 for optimum growth
Key c

422. Gram positive Cocci include
a) Staphylococci and Gonococci
b) Streptococci and Meningococci
c) Staphylococci and streptococci
d) Enterococci and Haemophilus sp
Key c

423. Widal test is done for
a) Enteric fever
b) Pulmonary tuberculosis
c) Respiratory infections and Typhoid Fever
d) Bacillary dysentery
Key a

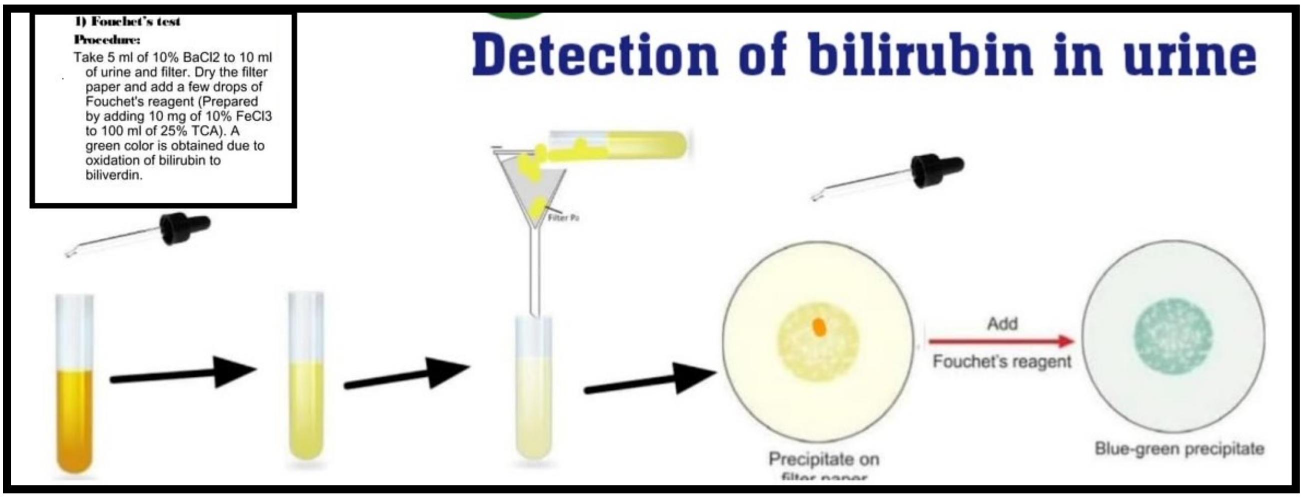


'BASU'

TEST OF DIAGNOSIS	TIME OF DIGNOSIS
BLOOD CULTURE (MAINSTAY FOR DIGNOSIS)	1ST WEEK
ANTIBODIES (WIDAL TEST)	2ND WEEK
STOOL CULTURE	3RD WEEK
URINE TEST	4ST WEEK

424. Chemical disinfectants include
a) Dettol, Lysol, cresol and povidone indine
b) Formaldehyde, silver nitrate
c) Ethyl alcohol
d) All of above
Key d

425. Detection of bile pigment (bilirubin) in urine is done by
a) Hay's test
b) Benzidine test
c) Fouchet's test
d) Sulfosalicylic acid test
Key c



Detection of bilirubin in urine

I) Fouchet's test

Procedure:

Take 5 ml of 10% BaCl2 to 10 ml of urine and filter. Dry the filter paper and add a few drops of Fouchet's reagent (Prepared by adding 10 mg of 10% FeCl3 to 100 ml of 25% TCA). A green color is obtained due to oxidation of bilirubin to biliverdin.

426. Gastric biopsy of a 42 year old man with peptic ulcer disease revealed numerous gram negative curved rods in the gastric mucosa. The most likely pathogen is

a) vibrio parahemolyticus
b) enterohemorrhagic Escherichia coli
c) helicobacter pylori
d) campylobacter jejuni
e) salmonella typhi
Key c

427. A 31 year old prostitute was found to have severe jaundice. She admitted to having multiple sexual partners. What could be the most likely cause of jaundice in this patient?
a) hepatitis A virus
b) hepatitis B virus
c) hepatitis C virus
d) hepatitis D virus
e) hepatitis E virus
Key b

The patient's history of multiple sexual partners suggests a higher risk of sexually transmitted infections (STIs). Hepatitis B virus (HBV) is a major STI that is commonly transmitted through sexual contact. While hepatitis C virus (HCV) can also be transmitted sexually, this mode of transmission is less common compared to blood-borne transmission.

428. A 15 year boy developed nausea and vomiting 5 hours after having a meal of fried rice that had been left over from the previous night's dinner at home. What is the most probable pathogen involved?
a) Staphylococcus aureus
b) salmonella enteritidis
c) vibrio cholerae
d) bacillus cereus
e) Escherichia coli
Key d

429. A person treated for meningitis is on cephalosporins. He develops watery diarrhea. On colonoscopy a Pseudo membrane was found on the colonic mucosa. The most likely pathogen involved is
a)campylobacter jejuni
b)enteroinvasive Escherichia coli
c)corynebacterium diphtheriae
d)clostridium difficile
e)enterotoxigenic Escherichia coli
Key d

430. A 10 year old girl presented with complaints of watery ,foul-smelling diarrhea, fever and abdominal pain. In the laboratory, gram negative rods were isolated from the culture which was revealed to require incubation at 42°C in microaerophilic environment. The most likely pathogen involved is

a) campylobacter jejuni
b) shigella flexineri
c) vibrio vulmificus
d) helicobacter pylori
e) campylobacter intestinalis
Key a

431. A 16-year old shepherd boy presented wit complaints of dry cough, fever and chest pain for a week. His symptoms worsened suddenly and he was rushed to the hospital where he died several hours later due to septic shock and hemorrhagic mediastinitis. The most likely pathogen involved is

a)clostridium botulinum
b)listeria monocytogenes
c)bacillus anthracis
d)streptococcus pneumoniae
e)corynebacterium diphtheria
Key c

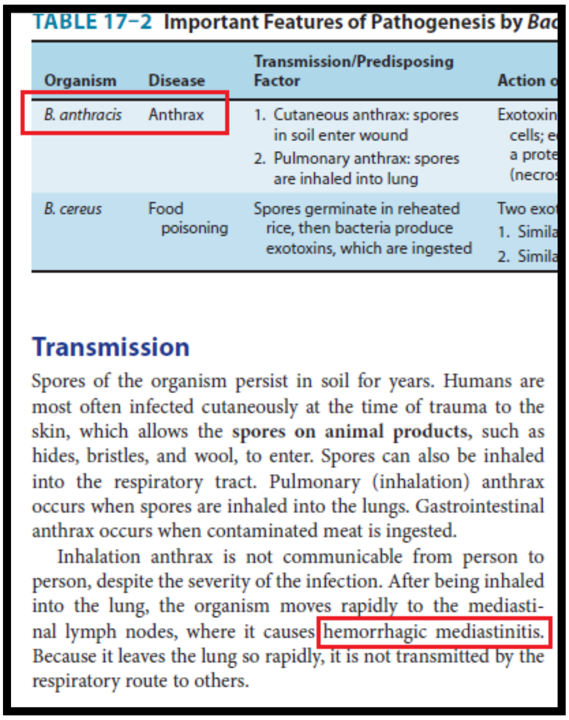


TABLE 17–2 Important Features of Pathogenesis by *Bac*

Organism	Disease	Transmission/Predisposing Factor	Action o
B. anthracis	Anthrax	1. Cutaneous anthrax: spores in soil enter wound 2. Pulmonary anthrax: spores are inhaled into lung	Exotoxin cells; e a prote (necros
B. cereus	Food poisoning	Spores germinate in reheated rice, then bacteria produce exotoxins, which are ingested	Two exo 1. Simila 2. Simila

Transmission

Spores of the organism persist in soil for years. Humans are most often infected cutaneously at the time of trauma to the skin, which allows the **spores on animal products**, such as hides, bristles, and wool, to enter. Spores can also be inhaled into the respiratory tract. Pulmonary (inhalation) anthrax occurs when spores are inhaled into the lungs. Gastrointestinal anthrax occurs when contaminated meat is ingested.

Inhalation anthrax is not communicable from person to person, despite the severity of the infection. After being inhaled into the lung, the organism moves rapidly to the mediastinal lymph nodes, where it causes hemorrhagic mediastinitis. Because it leaves the lung so rapidly, it is not transmitted by the respiratory route to others.

432. A two year old boy is rushed to the emergency in a state of severe dehydration. He is found to be passing ‘rice water stools’. What is the most likely pathogen involved?

a)vibrio cholera
b)Escherichia coli
c)salmonella typhi
d) Yersinia enterocolitica
e)clostridium perfringens
Key a

433. A three year old child presented with bloody diarrhea. Stool culture revealed non lactose fermenter colonies on mac conkey’s agar. The organism was non-motile.On TSI agar,the organism produced an alkaline slant and acid butt with no gas and H2S.What is the most likely pathogen?

- a) vibrio cholerae
- b) staphylococcus enterotoxin
- c) campylobacter intestinalis
- d) shigella dysenteriae
- e) salmonella typhi

Key d

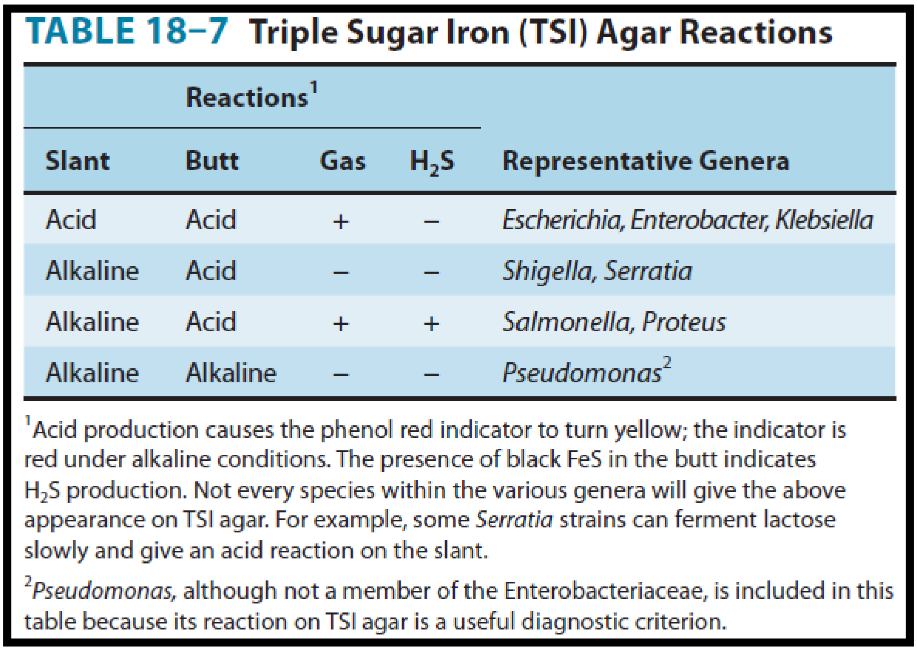
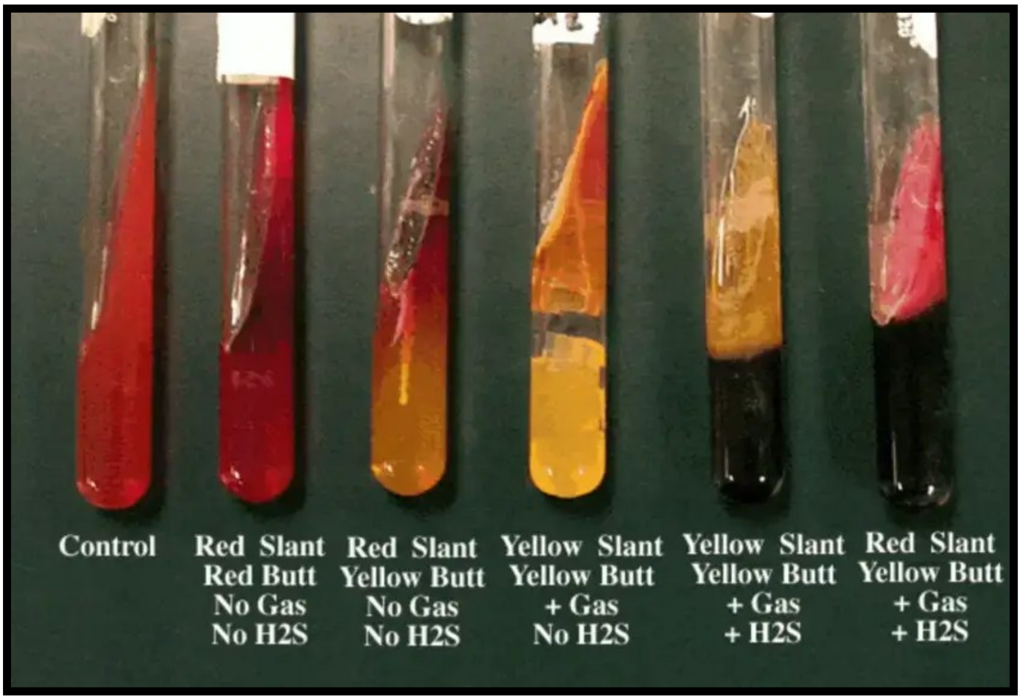


TABLE 18–7 Triple Sugar Iron (TSI) Agar Reactions

Reactions[1]				
Slant	Butt	Gas	H_2S	Representative Genera
Acid	Acid	+	–	*Escherichia, Enterobacter, Klebsiella*
Alkaline	Acid	–	–	*Shigella, Serratia*
Alkaline	Acid	+	+	*Salmonella, Proteus*
Alkaline	Alkaline	–	–	*Pseudomonas*[2]

[1] Acid production causes the phenol red indicator to turn yellow; the indicator is red under alkaline conditions. The presence of black FeS in the butt indicates H_2S production. Not every species within the various genera will give the above appearance on TSI agar. For example, some *Serratia* strains can ferment lactose slowly and give an acid reaction on the slant.

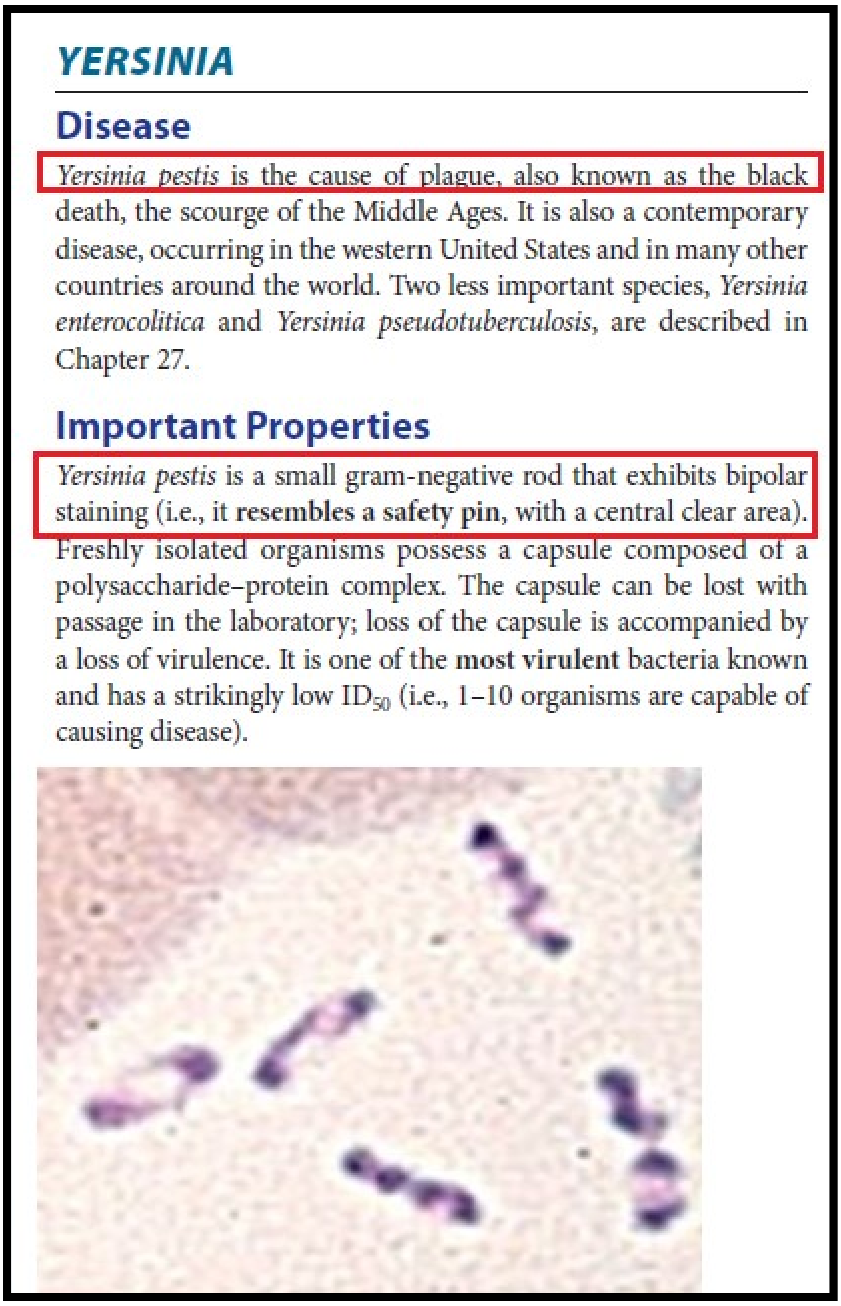
[2] *Pseudomonas,* although not a member of the Enterobacteriaceae, is included in this table because its reaction on TSI agar is a useful diagnostic criterion.


Control
Red Slant Red Butt No Gas No H2S
Red Slant Yellow Butt No Gas No H2S
Yellow Slant Yellow Butt + Gas No H2S
Yellow Slant Yellow Butt + Gas + H2S
Red Slant Yellow Butt + Gas + H2S

434. A 35 year old soldier from the war front arrived with fever and severe generalized swollen lymphnodes. Pus aspirated from the lympnodes revealed gram negative rods that had a safety pin appearance and showed bipolar staining. What is the most likely diagnosis?

a) vibrio parahemolyticus
b) Yersinia pestis
c) Yersinia pseudotuberculosis
d) vibrio vulmificus
e) bacillus anthracis

Key b



YERSINIA

Disease

Yersinia pestis is the cause of plague, also known as the black death, the scourge of the Middle Ages. It is also a contemporary disease, occurring in the western United States and in many other countries around the world. Two less important species, *Yersinia enterocolitica* and *Yersinia pseudotuberculosis*, are described in Chapter 27.

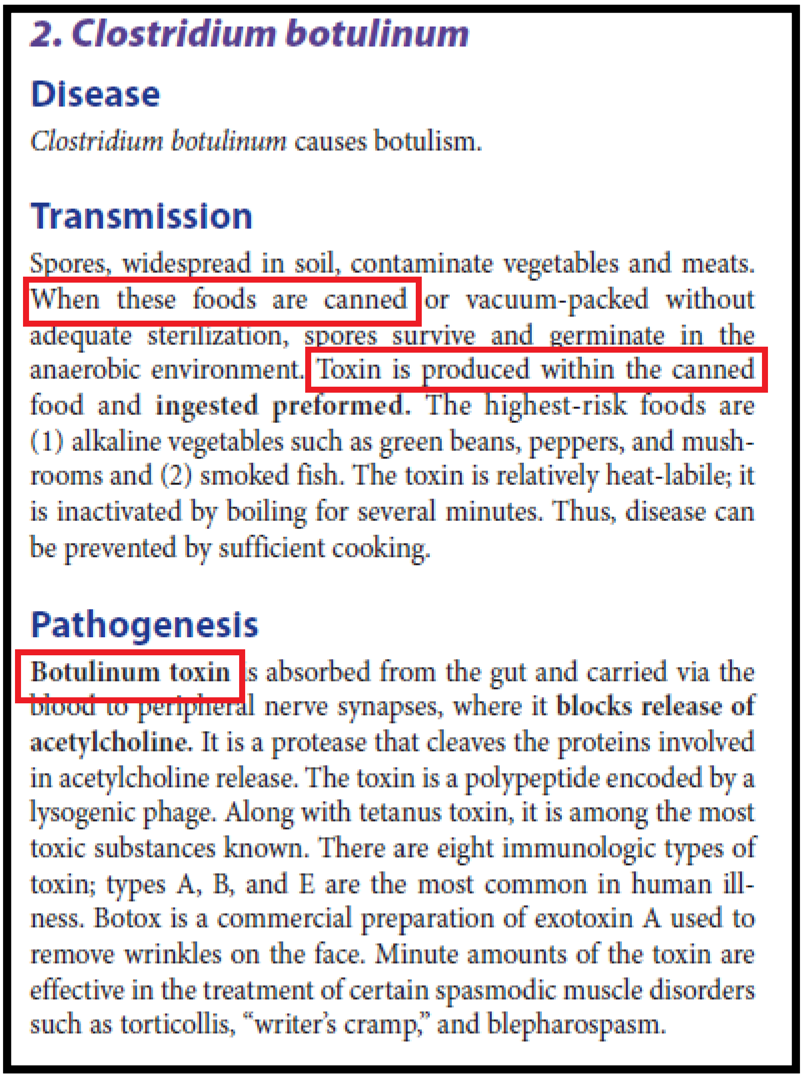
Important Properties

Yersinia pestis is a small gram-negative rod that exhibits bipolar staining (i.e., it **resembles a safety pin**, with a central clear area). Freshly isolated organisms possess a capsule composed of a polysaccharide–protein complex. The capsule can be lost with passage in the laboratory; loss of the capsule is accompanied by a loss of virulence. It is one of the **most virulent** bacteria known and has a strikingly low ID_{50} (i.e., 1–10 organisms are capable of causing disease).

435. A 21 year old woman was brought to the OPD in comatose state. She was having flaccid paralysis. Her family members said that she had gone on a diet lately and was in the habit of making salads using fresh produce as well as some canned vegetables like mushrooms and peas. Wat is the most likely causative organism?

a) Enterohemorrhagic E coli
b) Clostridium botulinum
c) Staphylococcus enterotoxin
d) Clostridium perfringens
e) Bacillus cereus

Key b



2. *Clostridium botulinum*

Disease

Clostridium botulinum causes botulism.

Transmission

Spores, widespread in soil, contaminate vegetables and meats. When these foods are canned or vacuum-packed without adequate sterilization, spores survive and germinate in the anaerobic environment. Toxin is produced within the canned food and **ingested preformed.** The highest-risk foods are (1) alkaline vegetables such as green beans, peppers, and mushrooms and (2) smoked fish. The toxin is relatively heat-labile; it is inactivated by boiling for several minutes. Thus, disease can be prevented by sufficient cooking.

Pathogenesis

Botulinum toxin is absorbed from the gut and carried via the blood to peripheral nerve synapses, where it **blocks release of acetylcholine.** It is a protease that cleaves the proteins involved in acetylcholine release. The toxin is a polypeptide encoded by a lysogenic phage. Along with tetanus toxin, it is among the most toxic substances known. There are eight immunologic types of toxin; types A, B, and E are the most common in human illness. Botox is a commercial preparation of exotoxin A used to remove wrinkles on the face. Minute amounts of the toxin are effective in the treatment of certain spasmodic muscle disorders such as torticollis, "writer's cramp," and blepharospasm.

436. A 25 year old presented to the OPD with complaints of fever, weight loss and right upper quadrant pain. O/E, the liver was found to be enlarged and tender. FNAC of the liver revealed brownish yellow pus with the consistency of 'anchovy paste '.What is the most likely diagnosis?

a)giardia lamblia
b)echinococcis granulosus
c)clonerchis sinensis
d)hepatitis B virus
e)entamoeba histolytica

Key E

437. A 34 year old farmer was brought to the emergency with headache, vomiting and seizure. CT scan revealed many cysts in the brain. What is the most likely organism involved?

a) Entamoeba histolytica
b) Taenia saginata
c) Echinococcus granulosus
d) Taenia solium
e) Diphyllobothrium latum

Key d (not C!! explanation given below)

The clinical presentation (headache, vomiting, seizures) along with multiple cysts in the brain on CT scan is highly suggestive of neurocysticercosis, which is caused by the larval stage (cysticercus) of Taenia solium (pork tapeworm).

Echinococcus granulosus (hydatid disease) typically forms cysts in the liver (70%) or lungs (20%). Brain

involvement is rare and occurs in fewer than 2% of cases.

438. A 42 year old woman presented to the OPD with complaints of gross hematuria and burning micturition. Biopsy of the urinary bladder revealed her to be having transitional cell carcinoma. What is the most likely diagnosis?

a) shistosoma mansoni
b) wucheireira bancrofti
c) clonerchis sinensis
d) paragonimus westermani
e) shistosoma haematobium

Key e

439. The mother of a two year old child came to the emergency in apparent distress. Her child was having severe rectal prolapse. On examination many whitish worms were seen embedded in the rectal mucosa. What is the most likely organism involved?

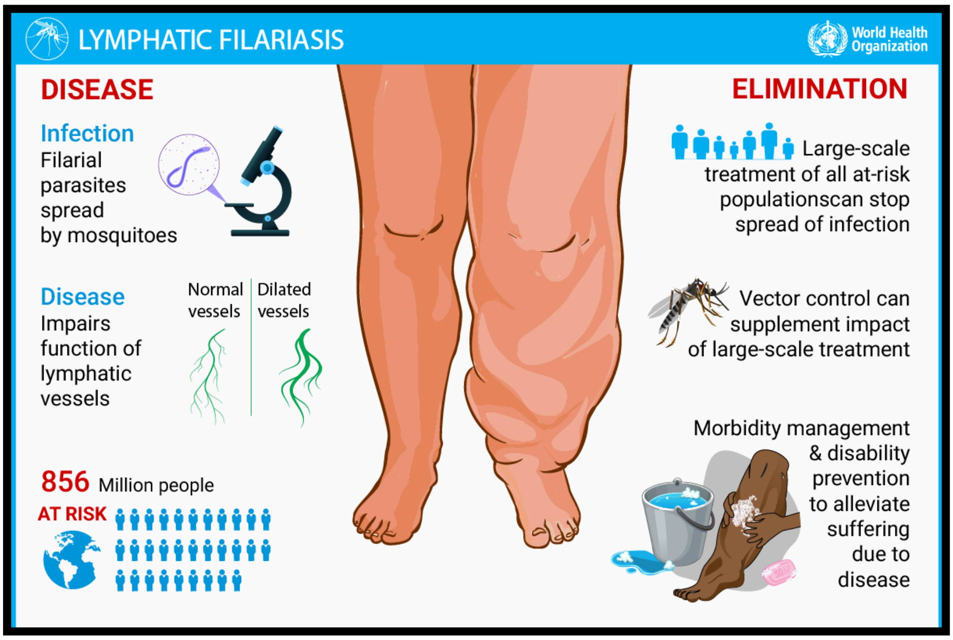
a) ascaris lumbricoides
b) trichinella spiralis
c) strongyloides stercoralis
d) trichuris trichiura
e) entrobius vermicularis

Key d

440. A 45 year old man from Ghana presents to the OPD with complaints of fever for the past few weeks. He has now developed gradually worsening swelling of his left leg which is now massive and edematous. The skin is thickened and the leg appears to be fibrosed. What is the most likely causative organism?

a) wuchereria bancrofti
b) onchocerca volvulus
c) dracunculus medinensis
d) loa loa
e) anisakis simplex

Key a


LYMPHATIC FILARIASIS
World Health Organization
DISEASE
Infection
Filarial parasites spread by mosquitoes
Disease
Impairs function of lymphatic vessels
Normal vessels
Dilated vessels
856 Million people
AT RISK
ELIMINATION
Large-scale treatment of all at-risk populationscan stop spread of infection
Vector control can supplement impact of large-scale treatment
Morbidity management & disability prevention to alleviate suffering due to disease

441. A group of manual workers are proceeding on job in Saudi Arabia. As part of the predeployment health screening, which viral markers should be tested?

a. PCR for HBV, HCV, HIV
b. HBsAg, Anti-HCV, Anti-HIV

c. HBeAg, Anti-HCV, Anti-HIV
d. Immunoblot for HBV, HCV, HIV
e. PCR for HIV only
Key b

Breakdown of Options:

- **a. PCR for HBV, HCV, HIV: PCR tests are more specific and sensitive but are expensive and not commonly used for routine pre-deployment screenings.**
- **b. HBsAg, Anti-HCV, Anti-HIV: This is the standard panel for viral marker screening during pre-deployment health checks.**
- **c. HBeAg, Anti-HCV, Anti-HIV: HBeAg is a marker of HBV replication, but it is not typically used for screening; HBsAg is the preferred marker.**
- **d. Immunoblot for HBV, HCV, HIV: Immunoblot tests are confirmatory and not used for initial screening.**
- **e. PCR for HIV only: This would miss the screening for HBV and HCV, which are also essential for pre-deployment health checks.**

442. A 20-years-old female presented with fever and severe body aches for the last three days. She was suspected as a case of dengue virus infection. Which of the following laboratory test will you perform to reach to a diagnosis?

a. Dengue PCR
b. Dengue IgM
c. Dengue NS1 Antigen
d. Dengue IgG
e. Dengue IgM and PCR
Key CORRECTED C > A (CONFIRMED BY VIROLOGY RESIDENTS)

Both tests (NS1 and PCR) are useful in the early phase, but NS1 antigen testing is quicker, easier, and more practical for diagnosing dengue within the first 5 days of illness, especially in endemic areas.
In cases where confirmation is needed for more complex cases, or for later stages of infection (when IgM and IgG appear), PCR might be used, but NS1 antigen is typically the first choice for early detection.

443. A 24-year-old lady with a BMI of 28.2 presented in dermatology clinic with Hirsutism, acne and menstrual irregularities. Her follicular phase hormonal profile was:

LH: 9.2 (4.8-10.7 mIU/L)
FSH: 3.6 (3.3-6.06 mIU/L)
Estradiol: 0.20 (0.18-0.14 -0.33 nmol/L)
Testosterone: 3.2 (0.42-2.05)
Most likely diagnosis is?
a. Adrenal tumor
b. Cushing syndrome
c. Late onset CAH
d. PCOS
e. Turner syndrome
Key d
DOES NOT BELONG

444. A 32-year-old female presents to the emergency department with a 3-day history of fever, chills, and lower abdominal pain. She reports dysuria and increased frequency of urination. Which of the following organisms is most likely responsible for the patient's infection?

a. Enterococcus faecalis
b. Pseudomonas aeruginosa
c. Staphylococcus saprophyticus
d. Klebsiella pneumoniae
e. Escherichia coli
Key e

445. Which of the following is a characteristic feature of Gram-negative bacteria?

a. Thick peptidoglycan layer
b. Presence of teichoic acid
c. Retention of crystal violet stain
d. Outer membrane containing lipopolysaccharide
e. Formation of endospores
Key d

446. A 16 year old girl presents to the OPD with 10 days history of fever with chills. She tells that the fever recurs the evening of every fourth day. What is the most likely causative organism?
a) plasmodium ovale
b) plasmodium malariae
c) plasmodium knowlesii
d) plasmodium vivax
e) plasmodium falciparum

Key b

- **Quartan malaria: Caused by *Plasmodium malariae*, with fever every 72 hours.**
- **Plasmodium malariae causes quartan fever, characterized by a fever recurrence every 72 hours (or on the fourth day, as described).**
- **Benign tertian malaria: Caused by *Plasmodium vivax* and *Plasmodium ovale*, with fever every 48 hours**

447. A 45-year-old man in Chicago presents to the OPD with 10 days history of fever with chills. He says that the fever is high grade and is accompanied with body aches and malaise. He gives a positive past history of a similar fever that he contracted few days after returning from a business trip to India 5 years back when he was 30. What is the most likely cause for developing his present symptoms?
a) Sporozoites of plasmodium vivax
b) Hypnozoites of plasmodium falciparum
c) Hypnozoites of plasmodium malariae
d) Sporozoites of plasmodium falciparum
e) Hypnozoites of plasmodium vivax

Key e

The patient has a history of fever with chills and malaise that occurred 5 years ago after traveling to India. The symptoms are likely due to relapse malaria from hypnozoites of Plasmodium vivax. Hypnozoites are dormant forms of the parasite that can remain in the liver for months or years after the initial infection, and they can reactivate later, causing a relapse of malaria.

Hypnozoites siraf Plasmodium vivax aur ovale keh bantay hain!

448. A 36 year old man is brought to the OPD in a drowsy state. He had a 3 weeks long history of recurrent episodes of fever with rigor and chills . Now, since the last 3 days, she started to develop drowsiness, generally deteriorating consciousness and is now slipping into a coma. What is the most likely causative agent?
a) Brucella Abortus
b) Plasmodium falciparum

c) Leishmania donovani
d) Dengue hemorrhagic fever virus
e) Ebola virus

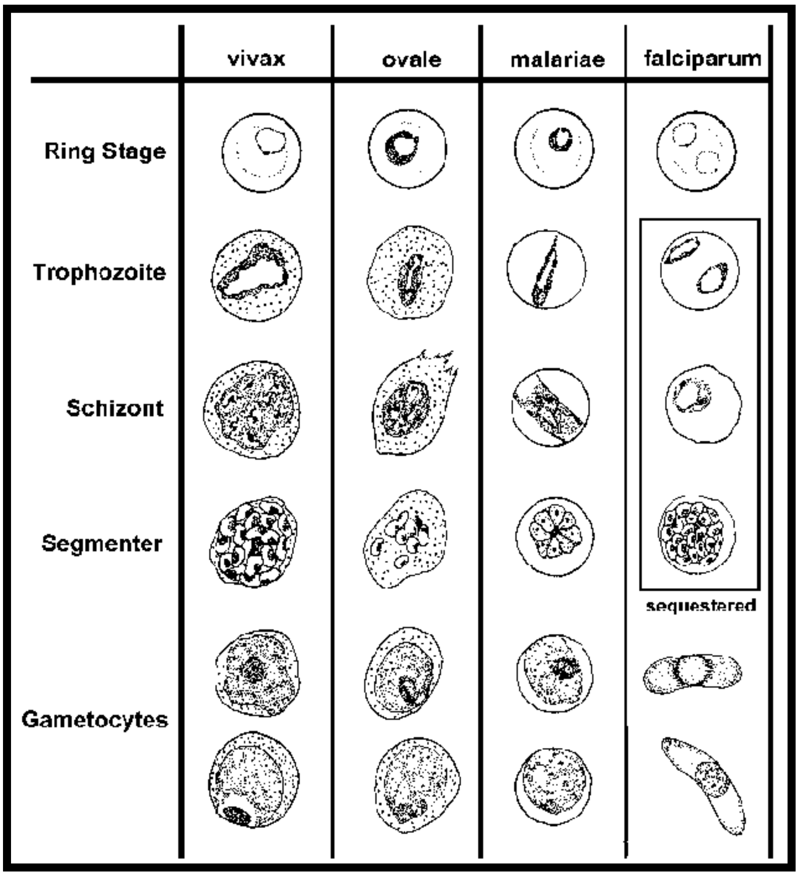
Key b

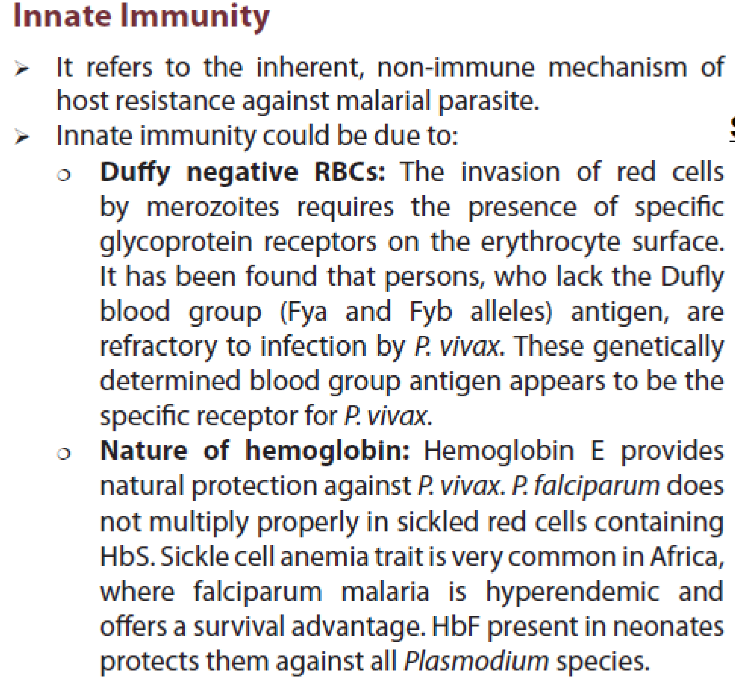
The patient's symptoms—**recurrent fever with rigor and chills** followed by **drowsiness, deteriorating consciousness, and coma**—are highly suggestive of **severe malaria**, particularly caused by *Plasmodium falciparum*. This species is known to cause more severe manifestations of malaria, including cerebral malaria, which can result in altered mental status, coma, and even death if not treated promptly. DON'T FORGET BLACKWATER FEVER ALSO

449. A 17 year old man presents to the OPD with complaints of 6 days history of fever with chills. The fever is accompanied with malaise, body aches and pains. A peripheral blood film reveals spherical gametocytes withinred blood cells. The following statement is true regarding the causative organism," individuals who :

a) Have sickle cell trait (heterozygous) are protected against it
b) Have sickle cell disease (homozygous) are protected against it
c) Have G6PD are protected against it
d) Do not have duffy blood antigen are protected against it
e) Do not have Rh blood antigen are protected against it

Key CORRECTED = D (kyunkeh baat Plasmodium vivax ki horai hai)





Innate Immunity

- It refers to the inherent, non-immune mechanism of host resistance against malarial parasite.
- Innate immunity could be due to:
  - **Duffy negative RBCs:** The invasion of red cells by merozoites requires the presence of specific glycoprotein receptors on the erythrocyte surface. It has been found that persons, who lack the Dufly blood group (Fya and Fyb alleles) antigen, are refractory to infection by *P. vivax*. These genetically determined blood group antigen appears to be the specific receptor for *P. vivax*.
  - **Nature of hemoglobin:** Hemoglobin E provides natural protection against *P. vivax*. *P. falciparum* does not multiply properly in sickled red cells containing HbS. Sickle cell anemia trait is very common in Africa, where falciparum malaria is hyperendemic and offers a survival advantage. HbF present in neonates protects them against all *Plasmodium* species.

Summary:

- Duffy negative is protected against P. vivax

- HbE protected agains P vixax

- Sickle protected against falciparum

- HbF protected against all Plasmodium spp

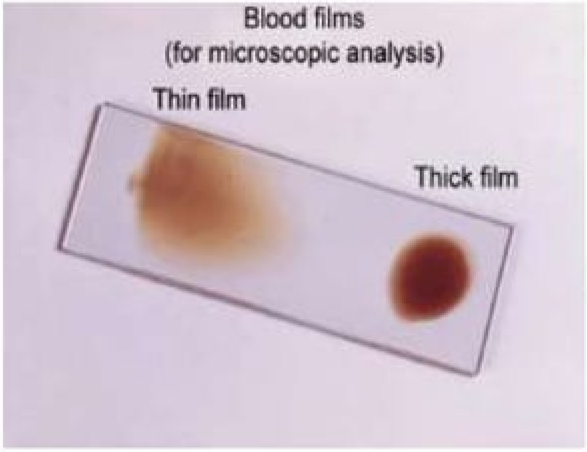
☐ **Sickle cell trait (heterozygous)** **provides partial protection against *Plasmodium falciparum*, leading to a lower risk or milder disease.**

☐ **Sickle cell disease (homozygous)** **provides strong protection against *Plasmodium falciparum* but comes with its own set of serious health issues.**

450. A 27 year old woman presents to the OPD with 9 days history of fever with chills. O/E, she has an enlarged spleen. A presumptive diagnosis of Malaria is made. In order to determine the species involved to ensure proper treatment, what would be the most appropriate lab investigation?

a) thin giemsa stained blood smear
b) blood culture
c) serum IgM antibody titre
d) thick giemsa stained blood smear
e) serum IgG antibody titre

Key a



451. A 25 year old woman presents to the OPD with three weeks history of recurrent episodes of fever with chills. She now presents to the OPD with 2 days history of passage of black coloured urine. O/E, the liver and spleen are massively enlarged. What is the most likely causative organism?

a) Dengue haemorrhagic fever

b) Leishmania donovani
c) Brucella melitensis
d) Plasmodium falciparum
e) Salmonella typhimurium

Key d

Explanation:

Cerebral malaria aur renal involvement falciparum infection ki na bhoolen!

- **The patient presents with fever, chills, and massive hepatosplenomegaly. This is characteristic of malaria, particularly *Plasmodium falciparum* infection.**
- **The black-colored urine is likely due to hemoglobinuria, a result of hemolysis caused by the destruction of infected red blood cells. This is a hallmark of severe malaria.**
- **P. falciparum can lead to severe complications such as acute renal failure and hemolysis, which contribute to the characteristic black urine and liver and spleen enlargement.**

452. A 17 year old boy presents to the OPD with complaints of dyspnoea, palpitations, easy fatiguability and recurrent attacks of sore throat. O/E, he has bruises all over his body and has a massively enlarged spleen. On peripheral blood smear, he is seen to have Pancytopenia. What is the most likely causative organism?

a) Plasmodium falciparum
b) Brucella melitensis
c) Leishmania donovani
d) Dengue fever virus
e) Yellow fever virus

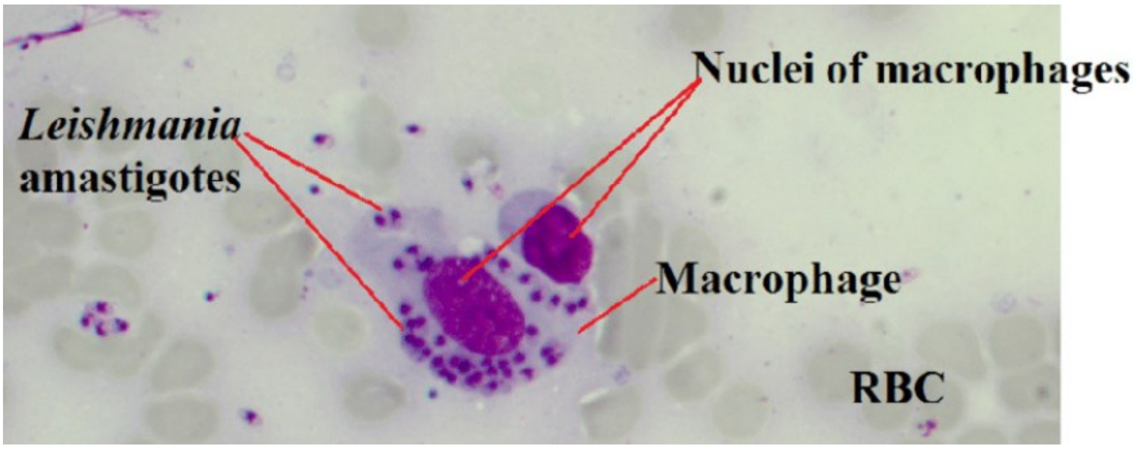
Key c

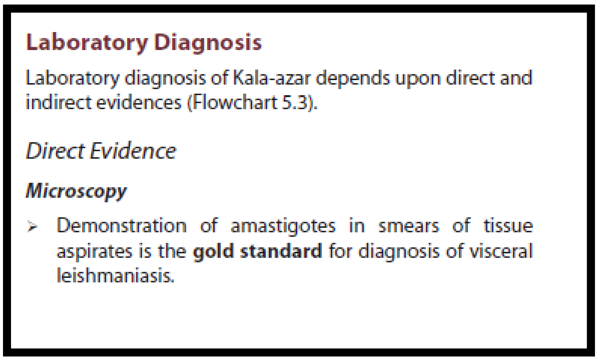
The most likely causative organism is Leishmania donovani. The patient's symptoms of dyspnoea, palpitations, easy fatiguability, bruising, pancytopenia, and massive splenomegaly are hallmark signs of visceral leishmaniasis (kala-azar). Recurrent sore throat can be attributed to immune suppression caused by bone marrow suppression and hypersplenism, leading to increased susceptibility to infections.

453. A 20 year old female presents to the OPD with complaints of high grade fever, myalgias and arthralgias for the past 7 days. O/E, she is found to have massive splenomegaly and pancytopenia. An infection with leishmania is suspected. What laboratory investigation will help make a confirmatory diagnosis in this case?

a) Promastigotes in tissue macrophages
b) Serum IgG antibody titre
c) Leishmannin skin test
d) serum IgM antibody titre
e) Amastigotes in tissue macrophages

Key e





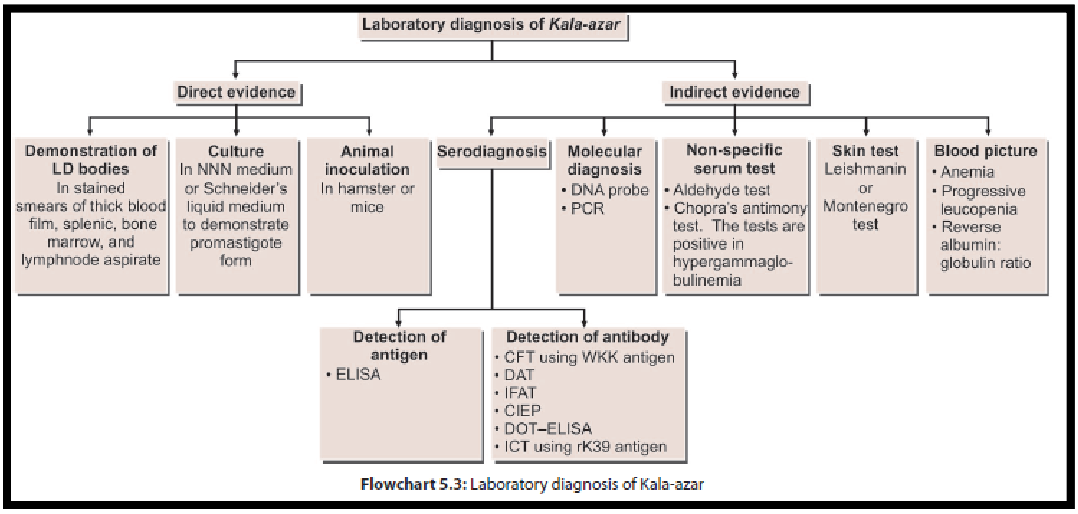
Laboratory Diagnosis

Laboratory diagnosis of Kala-azar depends upon direct and indirect evidences (Flowchart 5.3).

Direct Evidence

Microscopy

- Demonstration of amastigotes in smears of tissue aspirates is the **gold standard** for diagnosis of visceral leishmaniasis.

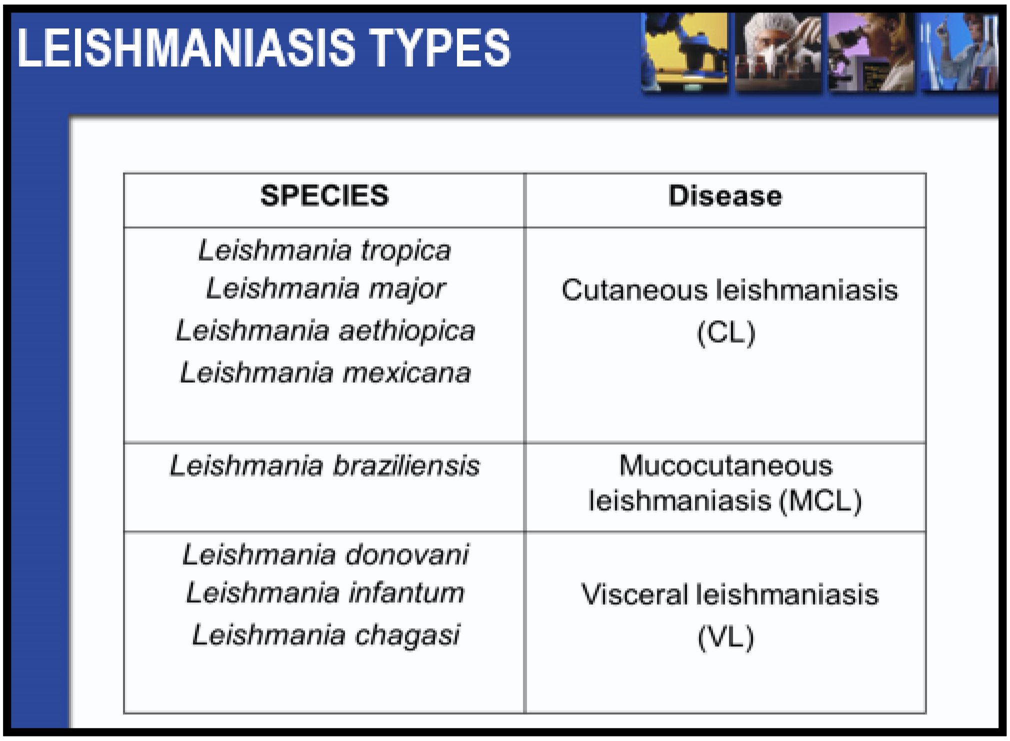

Laboratory diagnosis of Kala-azar
Direct evidence
Indirect evidence
Demonstration of LD bodies In stained smears of thick blood film, splenic, bone marrow, and lymphnode aspirate
Culture In NNN medium or Schneider's liquid medium to demonstrate promastigote form
Animal inoculation In hamster or mice
Serodiagnosis
Molecular diagnosis • DNA probe • PCR
Non-specific serum test • Aldehyde test • Chopra's antimony test. The tests are positive in hypergammaglobulinemia
Skin test Leishmanin or Montenegro test
Blood picture • Anemia • Progressive leucopenia • Reverse albumin: globulin ratio
Detection of antigen • ELISA
Detection of antibody • CFT using WKK antigen • DAT • IFAT • CIEP • DOT–ELISA • ICT using rK39 antigen

Flowchart 5.3: Laboratory diagnosis of Kala-azar

454. A 30 year old Hispanic man presents to the OPD with a lesion on his forearm for the past 8 days. O/E, the lesion is red and ulcerated. No, since the past 2 days, he has developed similar lesions around the naso-labial folds and angles of the mouth. A biopsy is taken from the lesion . What would be the most likely causative organism involved in this case?

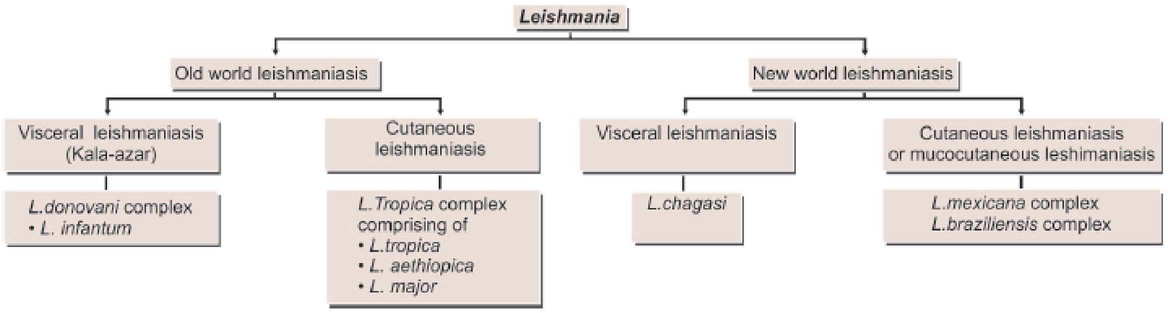
a) Leishmania mexicana
b) Leishmania braziliensis
c) Leishmania donovani
d) Leishmania Gondii
e) Leishmania tropica

Key b



LEISHMANIASIS TYPES

SPECIES	Disease
Leishmania tropica *Leishmania major* *Leishmania aethiopica* *Leishmania mexicana*	Cutaneous leishmaniasis (CL)
Leishmania braziliensis	Mucocutaneous leishmaniasis (MCL)
Leishmania donovani *Leishmania infantum* *Leishmania chagasi*	Visceral leishmaniasis (VL)


Leishmania
Old world leishmaniasis
New world leishmaniasis
Visceral leishmaniasis (Kala-azar)
Cutaneous leishmaniasis
Visceral leishmaniasis
Cutaneous leishmaniasis or mucocutaneous leshimaniasis
L.donovani complex
• L. infantum
L.Tropica complex comprising of
• L.tropica
• L. aethiopica
• L. major
L.chagasi
L.mexicana complex
L.braziliensis complex

Flowchart 5.2: Distribution and disease caused by *Leishmania* spp.

455. An 18 year old male university student comes to the OPD with complaints of 9 days history of high grade fever, abdominal pain and vomiting. The fever is low grade in the morning but starts gradually increasing in the evening and reaches a spike of 102-103 F in the night but never touches baseline. How can a confirmatory diagnosis be made in such a case?

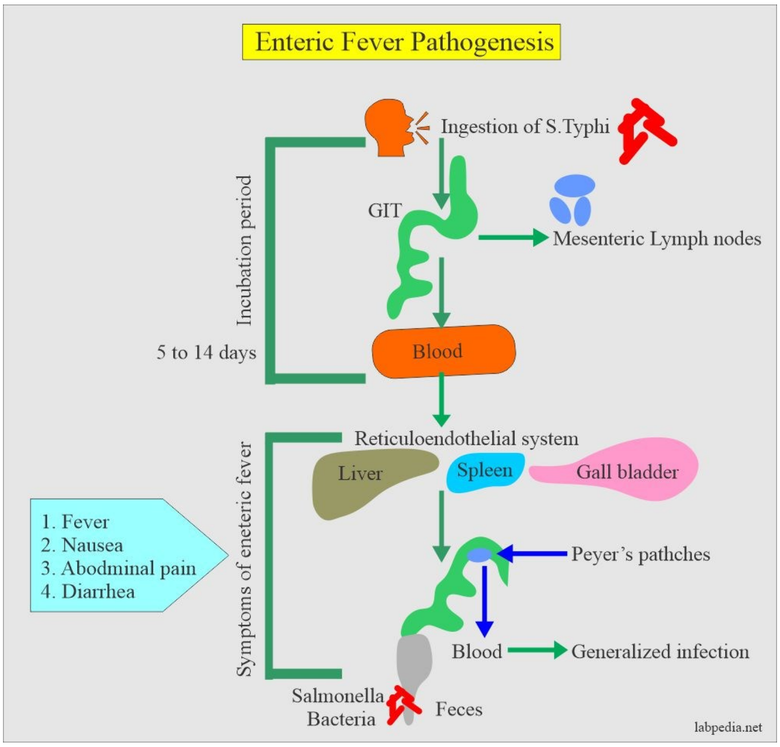
a) blood culture
b) typhidot IgM
c) stool culture
d) Widal test
e) urine culture

Key a (Remember mnemonic BASU!)

456. A 35 year old woman comes to the OPD with complaints of 7 days history of fever with abdominal pain. O/E, she is found to have a furred tongue, an enlarged liver and an enlarged spleen. A diagnosis of typhoid fever is made. Treatment is successfully completed. The following statement is true regarding the pathogenesis of typhoid fever:

a) Salmonella typhi is transmitted by eating Raw eggs and contaminated poultry
b) salmonella paratyphi A does not produce gas and only a small amount of H2S on TSI agar
c) salmonella typhi first enters and multiplies in the peyer's patches of the ileum
d) salmonella paratyphi is transmitted only by humans
e) salmonella typhi first enters and multiplies in the gall bladder

Key c


Enteric Fever Pathogenesis
Ingestion of S.Typhi
Incubation period
GIT
Mesenteric Lymph nodes
5 to 14 days
Blood
Reticuloendothelial system
Liver
Spleen
Gall bladder
Symptoms of eneteric fever
1. Fever
2. Nausea
3. Abodminal pain
4. Diarrhea
Peyer's pathches
Blood
Generalized infection
Salmonella Bacteria
Feces
labpedia.net

457. An 25 year old female teacher is brought to the OPD with a 3 weeks history of fever with abdominal pain, diarrhea and vomiting. Now, she has come in a drowsy state and deteriorating consciousness for the past 36 hours. The patient had been diagnosed with typhoid fever earlier on and was undergoing treatment but the symptoms did not resolve. What is the most likely complication that could be responsible for her symptoms?

a)intestinal perforation
b)metabolic acidosis
c)intracerebral hemorrhage
d)liver failure
e)renal failure

Key a

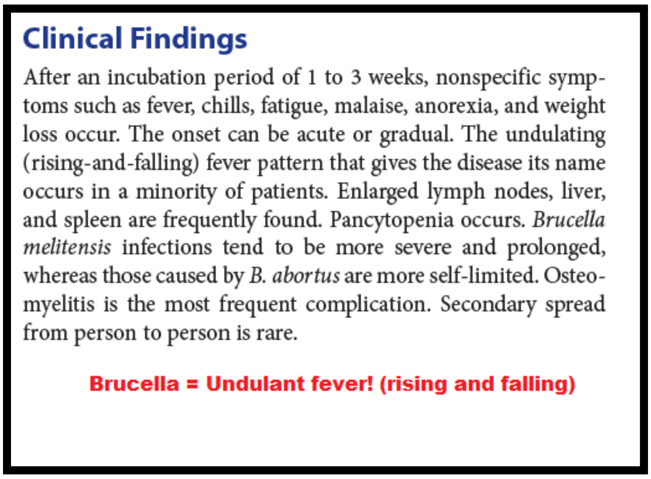
(VERYYYY IMPORTANT!)

Week of complicatons = 3rd week

458. A 25 year old shepherd boy is brought to the OPD with a 7 days history of fever, anorexia, body aches and malaise. The fever is intermittent, it rises and falls over the course of the day but never once touches the baseline. O/E, enlarged lymph nodes , an enlarged liver and enlarged spleen are found. What is the most likelymode of transmission of the causative organism?

a) ingestion of raw contaminated eggs
b) bite of infected female anopheles mosquito
c) sexual contact
d) ingestion of contaminated milk products
e) bite of infected female Aedes Aegypti mosquito

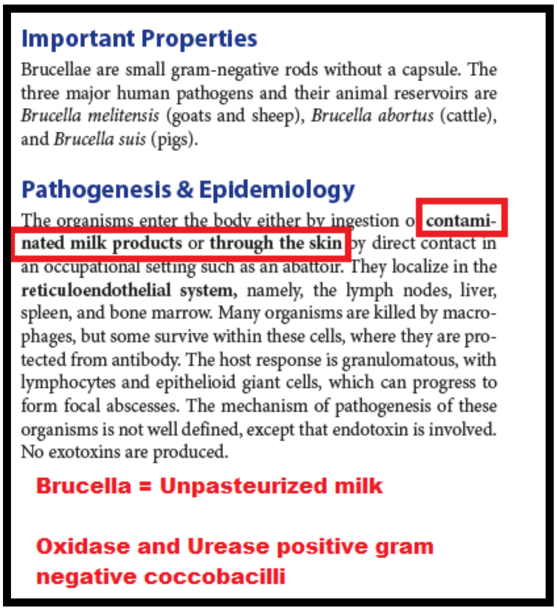
Key d (Pathogen = brucella)



Clinical Findings

After an incubation period of 1 to 3 weeks, nonspecific symptoms such as fever, chills, fatigue, malaise, anorexia, and weight loss occur. The onset can be acute or gradual. The undulating (rising-and-falling) fever pattern that gives the disease its name occurs in a minority of patients. Enlarged lymph nodes, liver, and spleen are frequently found. Pancytopenia occurs. *Brucella melitensis* infections tend to be more severe and prolonged, whereas those caused by *B. abortus* are more self-limited. Osteomyelitis is the most frequent complication. Secondary spread from person to person is rare.

Brucella = Undulant fever! (rising and falling)



Important Properties

Brucellae are small gram-negative rods without a capsule. The three major human pathogens and their animal reservoirs are *Brucella melitensis* (goats and sheep), *Brucella abortus* (cattle), and *Brucella suis* (pigs).

Pathogenesis & Epidemiology

The organisms enter the body either by ingestion of **contaminated milk products or through the skin** by direct contact in an occupational setting such as an abattoir. They localize in the **reticuloendothelial system,** namely, the lymph nodes, liver, spleen, and bone marrow. Many organisms are killed by macrophages, but some survive within these cells, where they are protected from antibody. The host response is granulomatous, with lymphocytes and epithelioid giant cells, which can progress to form focal abscesses. The mechanism of pathogenesis of these organisms is not well defined, except that endotoxin is involved. No exotoxins are produced.

Brucella = Unpasteurized milk

Oxidase and Urease positive gram negative coccobacilli

459. A 20 year old man from Karachi, Pakistan went on a safari trip to south Africa with his friends. Few days after his return, he developed sudden onset of fever, headache, myalgias and arthralgia. He also develops photophobia. O/E he has jaundice and enlarged liver. He also gives history of episodes of black vomit.
Regarding yellow fever, which of the following statement is correct ? " It cannot occur in Pakistan because

a) vector is not present
b) reservoir is not present
c) agent is not present
d) both vector and agent are not present
e) vector was present but has been eradicated

Key c

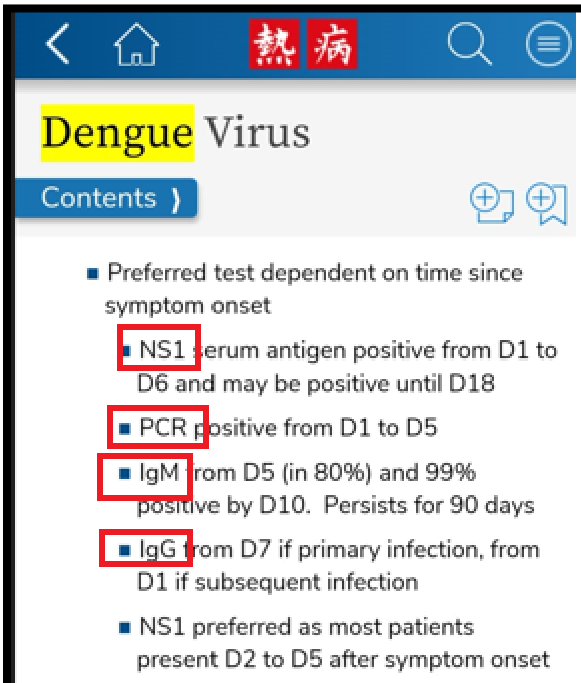
Yellow Fever Virus:

- **The virus is endemic to specific regions of sub-Saharan Africa and South America and is transmitted primarily by Aedes aegypti mosquitoes.**
- **While Aedes aegypti, the primary vector, is present in Pakistan, the yellow fever virus (the agent) is not present in the region. Hence, yellow fever cannot naturally occur in Pakistan.**

460. A 22 year old woman comes to the OPD with a 5 days history of high grade fever . The fever is accompanied with cough and severe pain in the muscles and joints which she describes as a bone crushing sensation. O/E, she has generalized lymphadenopathy. How can a confirmatory diagnosis be made in such a case?

a) CBC showing leukopenia
b) blood culture
c) CBC showing platelet count less than 10,000/mm3
d) serum IgG antibody titre
e) serum IgM antibody titre

Key e


熱 病
Contents ⟩

Dengue Virus

- Preferred test dependent on time since symptom onset
  - NS1 serum antigen positive from D1 to D6 and may be positive until D18
  - PCR positive from D1 to D5
  - IgM from D5 (in 80%) and 99% positive by D10. Persists for 90 days
  - IgG from D7 if primary infection, from D1 if subsequent infection
  - NS1 preferred as most patients present D2 to D5 after symptom onset

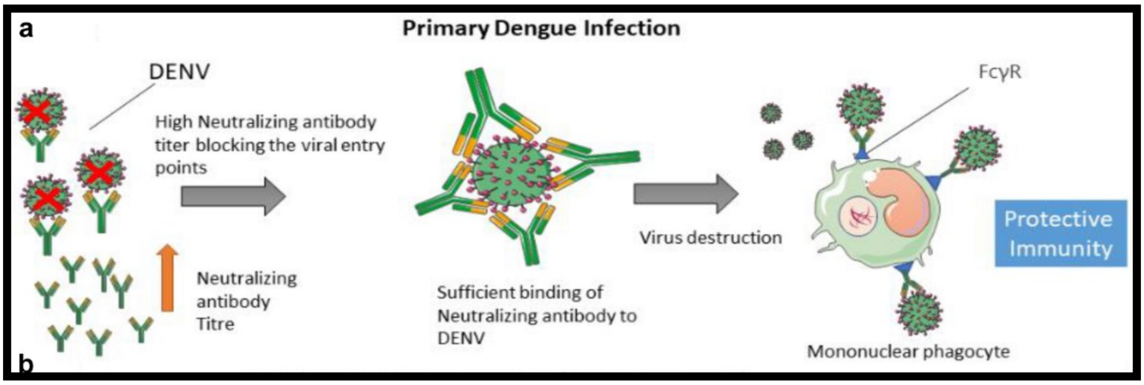
Dengue Dx timelines

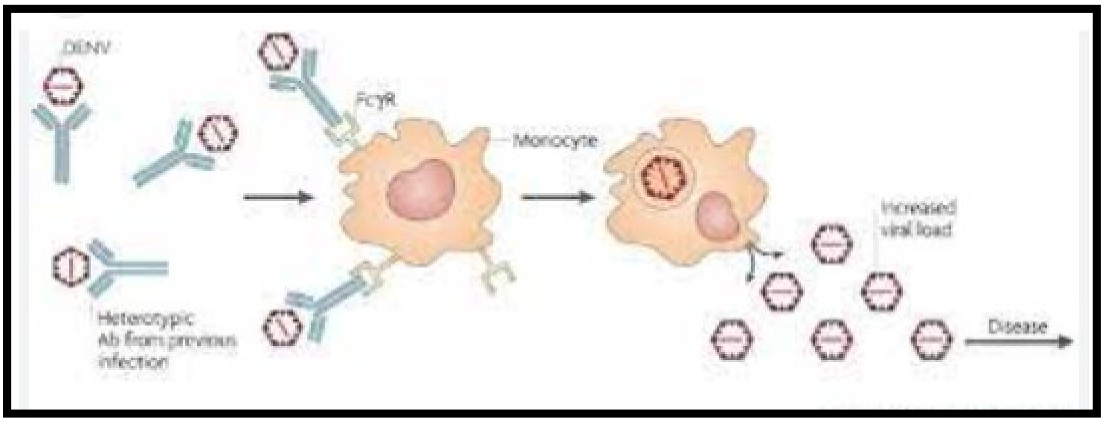
Sanford

461. A 20 year old patient comes to the OPD with 6 days history of high grade fever, severe arthralgias and severe painful myalgias. O/E, he has petechiaes all over his body. Dengue hemorrhagic fever is suspected. What is the pathogenesis of this condition?

a) antigen-antibody mediated hypersensitivity reaction
b) production of cross-reacting antibodies*
c) IgE mediated hypersensitivity reaction
d) production of auto antibodies
e) delayed cell mediated hypersensitivity reaction

Key b (Antibody dependent enhacement)


a
Primary Dengue Infection
DENV
High Neutralizing antibody titer blocking the viral entry points
Neutralizing antibody Titre
Sufficient binding of Neutralizing antibody to DENV
Virus destruction
FcγR
Protective Immunity
Mononuclear phagocyte
b


DENV
FcγR
Monocyte
Increased viral load
Heterotypic Ab from previous infection
Disease

462. A 17 year old male comes to the complaints of high grade fever with bony pains and muscle pains. O/E, he has generalized lymphadenopathy and has a maculopapular rash. O/E, he has leukopenia and a low platelet count. What is the mode of transmission of this causative agent??

a) Feco -oral route
b) respiratory air-borne droplet transmission
c) bite of infected female Aedes Aegypti mosquito
d) ingestion of contaminated milk
e) bite of infected female Anopheles mosquito

Key c

Clinical Presentation:

- **High-grade fever, bony and muscle pains ("breakbone fever"), generalized lymphadenopathy, maculopapular rash, leukopenia, and thrombocytopenia are classic features of dengue fever.**
- **Dengue is caused by the dengue virus, transmitted primarily by the Aedes aegypti mosquito.**

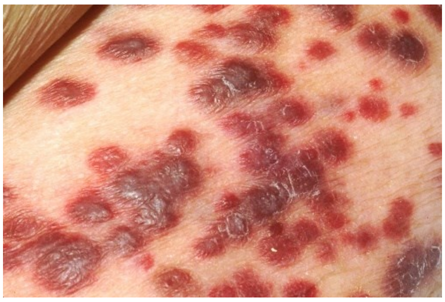
HIV

463. A 24 year old HIV positive male homosexual notices bluish discolouration on his forearm while showering in the morning. He went to the doctor to get it checked. What is the most likely causative organism?

a) human herpes virus 8
b) herpes simplex virus
c) human herpes virus 6
d) cytomegalovirus
e) Epstein barr virus

Key a

The most likely cause is HHV-8 (Human herpesvirus 8), which causes Kaposi's sarcoma, a vascular tumor common in HIV-positive patients. It presents as bluish or purplish skin lesions. Other options like HSV, CMV, and EBV do not cause such lesions.



464. A 28 year old homosexual man presents to the OPD with a 3 weeks history of fever, recurrent attacks of pharyngitis and malaise. O/E, he has generalized lymphadenopathy. He gives history of multiple sexual partners. An HIV infection is suspected. What is the laboratory investigation which will confirm the diagnosis?

a) western blot for HIV antigen
b) western blot for HIV antibody
c) a low CD4 cell count
d) ELISA for HIV antibodies
e) ELISA for HIV antigens

Key CONTROVERSIAL but discussed with my friend in virology and she said E.

CONTROVERSIAL ==== Original key was western blot for HIV antigen

In the early stages of HIV infection (acute or primary HIV infection), there is a window period where antibodies to HIV may not yet be detectable. However, HIV antigens, particularly the p24 antigen, appear earlier in the blood and can be detected by antigen-based assays like ELISA for HIV antigens.

465. A 40 year old HIV positive woman presents with a 5 weeks history of non productive cough, low grade fever and progressively worsening shortness of breath. Chest X ray reveals ground glass infiltrates bilaterally. What is the most likely causative organism involved?

a) histoplasma capsulatum
b) mycobacterium avium intracellulare
c) pneumocystis jirovecii
d) mycobacterium tuberculosis
e) candida albicans

Key c

466. A 37 year old HIV positive man develops a 3 days history of fever, neck stiffness, photophobia and deteriorating consciousness. Lumbar puncture is performed. CSF exam reveals high protein and decreased glucose but no organism is detected on gram stain. What is the most likely causative organism involved?

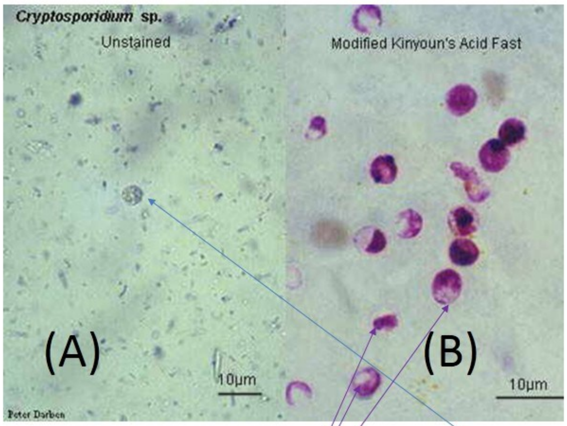
a) toxoplasma gondii
b) cytomegalovirus
c) human herpes virus 8
d) Cryptococcus neoformans
e) Cryptosporidium parvum

Key d

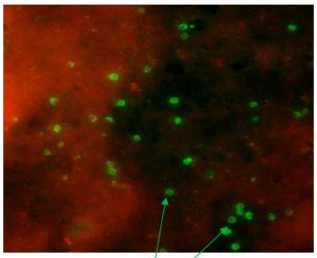
467. A 33 year old HIV positive male homosexual presents to the OPD with complaints of watery non-bloody diarrhea for the past 3 weeks. It is associated with anorexia and un-documented weight loss. Examination of stool reveals numerous acid fast cysts. What is the most likely causative organism?

a) Giardia lamblia
b) Balantidium coli
c) Cryptococcus neoformans
d) Pneumocystis jirovecii
e) Cryptosporidium parvum

Key e



(A) Unstained wet mount showing an oocyst (centre) of *Cryptosporidium* species
(B) Modified Kinyoun's acid-fast stained smear of stool showing oocysts of *Cryptosporidium* species



Direct fluorescent antibody (DFA) assay showing oocysts of *Cryptosporidium* species
Features of this test:
- ✓ **highest combination of sensitivity and specificity**
- ✓ **gold standard method**

468. A 20 year old student presents to the OPD with 7 days history of fever with chills. The fever recurs every third day. A peripheral smear was done and banana-shaped gametocytes of a parasite were seen within the RBC's in the film. What is the most likely causative organism?

a) plasmodium ovale
b) plasmodium malariae

c) plasmodium knowlesii
d) plasmodium vivax
e) plasmodium falciparum

Key e

469. A 32 year old man presents to the OPD with 8 days history of intermittent fever with chills. O/E, he has an enlarged spleen. The physician suspects Malaria . In order to detect the prescence of plasmodium in this patient, what would be the most appropriate lab investigation?
a) thin Giemsa stained blood smear
b) blood culture
c) serum IgM antibody titre
d) thick Giemsa stained blood smear
e) serum IgG antibody titre
Key d

470. A 15 year old girl presents to the OPD with complaints of intermittent high grade fever for the past 10 days. O/E, his lymph nodes were enlarged and he had hepatosplenomegally. A lymph node biopsy was done and amastigotes of leishmania donovani were seen. What would be the findings on peripheral smear of such a patient?
a) microcytic hypochromic anaemia
b) thrombocytopaenia
c) pancytopaenia
d) megaloblasticanaemia
e) leukopaenia

Key c

Pancytopenia (reduction in RBCs, WBCs, and platelets) is a hallmark of visceral leishmaniasis due to bone marrow suppression caused by parasitic infiltration and hypersplenism.

471. A 25 year old man came to the OPD with complaints of 7 days history of fever with abdominal pain. O/E, He was found have an enlarged spleen. Blood culture and Typhidot IgM were done and a diagnosis of typhoid fever is made. Treatment was successfully completed. Two weeks after the treatment the physician wanted to rule out the possibility of the patient having become an asymptomatic carrier. Which lab investigation would most help him reach a decision?
a) urine culture
b) blood culture
c) bone marrow culture
d) stool culture
e) CSF culture

Key d

After recovery from typhoid fever, some individuals may become asymptomatic carriers, harboring Salmonella Typhi in their gallbladder and shedding the bacteria in their stool.

472. A 30 year old abbatoir worker is brought to the OPD with a 10 days history of fever, anorexia, body aches and malaise. The fever is intermittent in nature, it rises and falls over the course of the day but never once touches the baseline. O/E, he is found to have generalized lymphadenopathy and hepatosplenomegaly. What is the most likely causative organism?
a) Salmonella Para typhi B
b) Dengue fever virus
c) Plasmodium knowlesii
d) Brucella melitensis
e) Yellow fever virus

Key d

☐ A 30-year-old abbatoir worker with fever, anorexia, body aches, malaise, generalized lymphadenopathy, and hepatosplenomegaly strongly suggests brucellosis.

☐ The intermittent fever ("undulant fever") that rises and falls without reaching baseline is a hallmark feature of brucellosis.
☐ Occupational exposure (working in an abattoir) increases the risk of Brucella infection due to contact with infected animals or their products.

473. A 20 year old engineer from Lahore went on a safari trip to Madagascar with his friends. Few days after his return, he developed sudden onset of fever, headache, myalgias and arthralgias. He also develops photophobia. O/E he had jaundice and an enlarged liver. He also gave history of passage of black coloured vomitus. What isthe most likely causative organism involved?

a) Dengue fever virus
b) Lassa fever virus
c) yellow fever virus
d) Hanta fever virus
e) Crimean congo hemorrhagic fever

Key c

☐ Clinical Presentation:

- **The sudden onset of fever, headache, myalgia, and arthralgia, along with jaundice, hepatomegaly, and black vomitus (indicative of gastrointestinal hemorrhage), is characteristic of yellow fever.**
- **The travel history to Madagascar, a region where yellow fever is endemic, strengthens this diagnosis.**

☐ Causative Agent:

- **Yellow fever virus is a flavivirus transmitted by the Aedes aegypti mosquito.**
- **Severe cases involve hepatic necrosis, leading to jaundice and hemorrhagic complications like black vomitus (caused by gastrointestinal bleeding).**

☐ Why Not the Other Options?

- **a) Dengue fever virus: Causes fever, myalgia, and hemorrhagic complications but does not typically present with jaundice or black vomitus.**
- **b) Lassa fever virus: Endemic to West Africa, not Madagascar, and usually involves hemorrhagic fever without prominent jaundice.**
- **d) Hanta fever virus: Associated with hemorrhagic fever with renal syndrome or hantavirus pulmonary syndrome, not jaundice or black vomitus.**
- **e) Crimean-Congo hemorrhagic fever (CCHF): Causes hemorrhagic fever but does not typically involve jaundice.**

474. A 22 year old female comes to the OPD with 6 days history of high grade fever, severe arthralgias and severe painful myalgias. O/E, she has petechiaes all over her body. Dengue hemorrhagic fever is suspected. What lab investigation would be most helpful in supporting a diagnosis?

a) microcytic hypochromic anaemia
b) thrombocytopenia
c) elevated liver enzymes
d) pancytopenia
e) reticulocytosis

Key b

475. A 28 year old shepherd from Azad Kashmir was brought to the OPD in a drowsy state. His friend gave a history of a high grade fever for the past 10 days which was accompanied by myalgias, arthralgias, neck stiffness, headache, burning eyes and photophobia. Gradually, he became drowsy and lost consciousness over the last 24 hours. He was admitted. 2 days post admission , he started bleeding from all orifices and mucosal surfaces and developed generalized petechiae all over his body. What is the most likely diagnosis?

a) Crimean congo hemorrhagic fever
b) blackwater fever
c) yellow fever
d) cerebral malaria
e) brucellosis

Key a

This patient presents with a combination of high-grade fever, myalgias, arthralgias, headache, neck stiffness, photophobia, and drowsiness, which is indicative of a viral infection. The subsequent development of

bleeding from mucosal surfaces, petechiae, and loss of consciousness suggests a hemorrhagic condition, typical of CCHF.

CCHF is transmitted primarily by the Hyalomma tick and can cause severe hemorrhagic manifestations. In this case, the patient's occupation as a shepherd and exposure to potentially infected animals supports this diagnosis.

476. A 19 year old African Village girl developed sudden onset of high grade fever, generalized myalgias, fatiguability, headache and sore throat for the past 3 days. On the 4th day, she developed vomiting and diarrhea and a maculopapular rash erupted over her trunk and extremities. On day 6, she started bleeding from all her orifices. Lab investigations revealed leukopenia, thrombocytopenia and elevated AST &ALT. what is the most likely causative organism?

a) Epstein-barr virus
b) Ebola fever virus
c) brucella abortus
d) plasmodium falciparum
e) leishmaniadonovani

Key b

The patient's sudden onset of **high-grade fever**, **myalgias**, **fatiguability**, **headache**, and **sore throat** followed by **vomiting**, **diarrhea**, **maculopapular rash**, and **bleeding from orifices** are consistent with the clinical features of **Ebola hemorrhagic fever**. The lab findings of **leukopenia**, **thrombocytopenia**, and **elevated AST & ALT** also support this diagnosis. **Ebola virus** belongs to the family **Filoviridae** and the genus **Ebolavirus**.

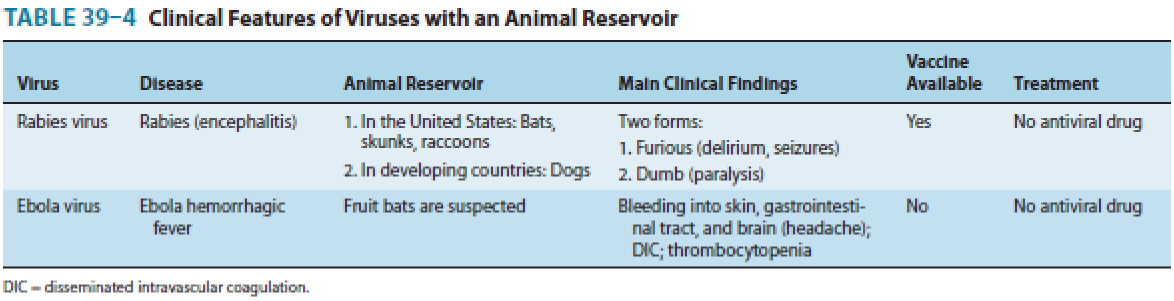


TABLE 39–4 Clinical Features of Viruses with an Animal Reservoir

Virus	Disease	Animal Reservoir	Main Clinical Findings	Vaccine Available	Treatment
Rabies virus	Rabies (encephalitis)	1. In the United States: Bats, skunks, raccoons 2. In developing countries: Dogs	Two forms: 1. Furious (delirium, seizures) 2. Dumb (paralysis)	Yes	No antiviral drug
Ebola virus	Ebola hemorrhagic fever	Fruit bats are suspected	Bleeding into skin, gastrointestinal tract, and brain (headache); DIC; thrombocytopenia	No	No antiviral drug

DIC = disseminated intravascular coagulation.

477. A 24 year old male homosexual noticed a bluish discoloration on his forearm while changing his clothes for work. He went to a doctor to get it checked. After thorough examination he was told that he had Kaposi's Sarcoma. Which of the following organism most likely predisposes for developing Kaposi's Sarcoma ?

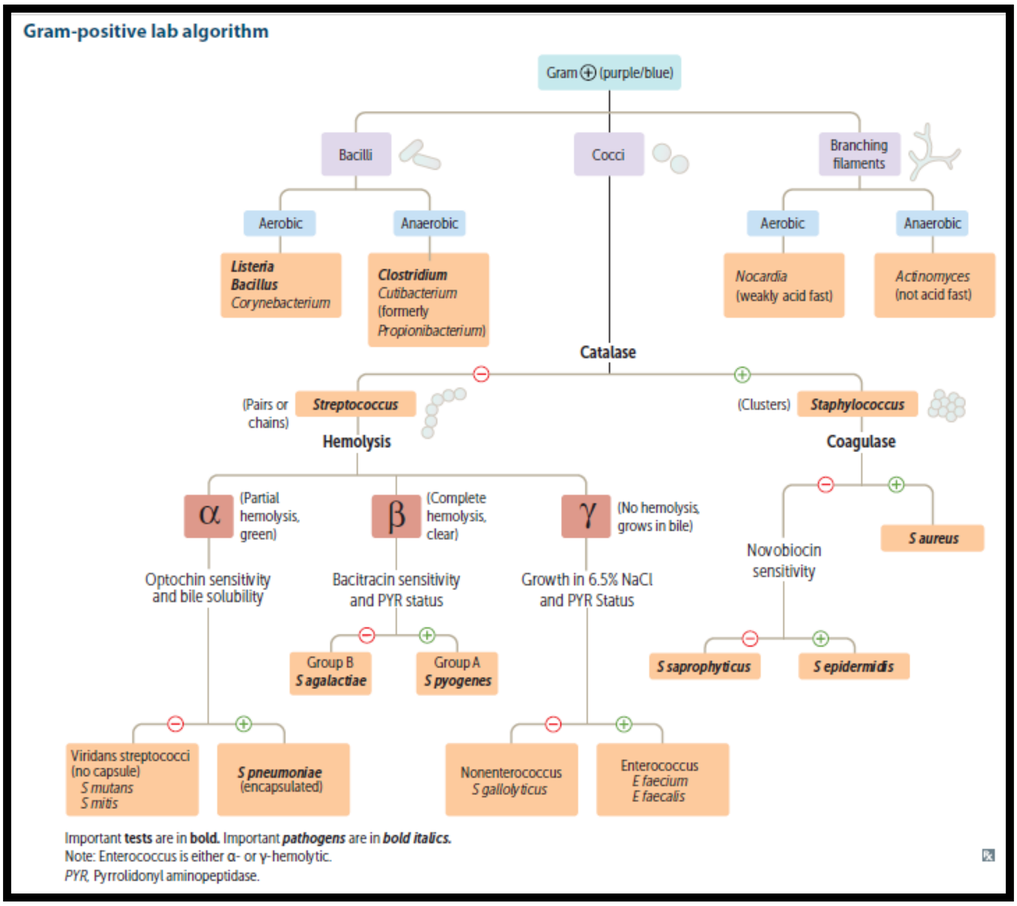
a) human immunodeficiency virus
b) Epstein barr virus
c) human papilloma virus
d) ebola virus
e) lassa fever virus

Key a (HHV 8 human herpes virus 8 is the cause of Kaposi)

478. A 25 year old man came to the OPD with complaints of sore throat and fever for the last three days. O/E, his cervical lymph nodes were found to be enlarged and tender. A throat swab culture yielded gram positive bacteria. It was further revealed that the bacteria were beta hemolytic and were sensitive to Bacitracin. What is the most likely diagnosis??

a) Streptococcus agalactiae
b) streptococcus pneumoniae
c) streptococcus pyogenes
d) streptococcus bovis
e) streptococcus viridians

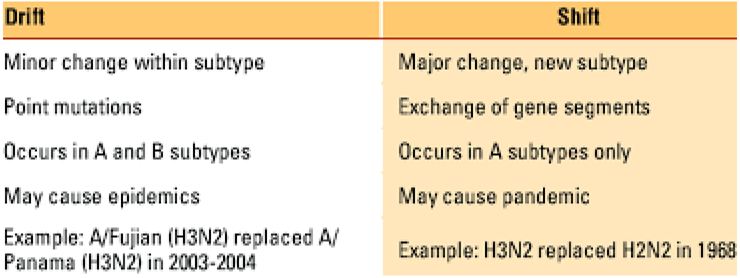
Key c

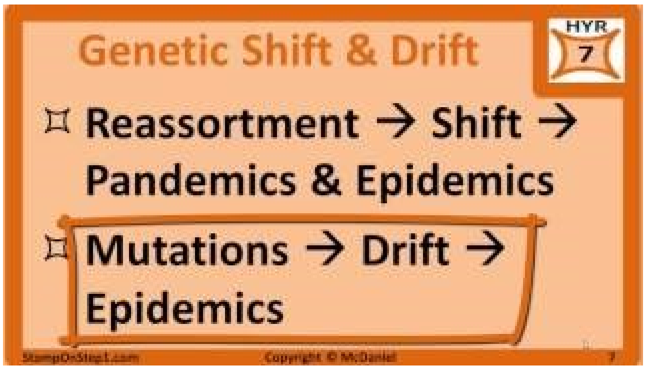

Gram-positive lab algorithm
Gram ⊕ (purple/blue)
Bacilli
Cocci
Branching filaments
Aerobic
Anaerobic
Aerobic
Anaerobic
Listeria
Bacillus
Corynebacterium
Clostridium
Cutibacterium (formerly Propionibacterium)
Nocardia (weakly acid fast)
Actinomyces (not acid fast)
Catalase
(Pairs or chains)
Streptococcus
Hemolysis
(Clusters)
Staphylococcus
Coagulase
α
(Partial hemolysis, green)
β
(Complete hemolysis, clear)
γ
(No hemolysis, grows in bile)
Novobiocin sensitivity
S aureus
Optochin sensitivity and bile solubility
Bacitracin sensitivity and PYR status
Growth in 6.5% NaCl and PYR Status
Group B S agalactiae
Group A S pyogenes
S saprophyticus
S epidermidis
Viridans streptococci (no capsule) S mutans S mitis
S pneumoniae (encapsulated)
Nonenterococcus S gallolyticus
Enterococcus E faecium E faecalis
Important **tests** are in **bold**. Important ***pathogens*** are in ***bold italics***.
Note: Enterococcus is either α- or γ-hemolytic.
PYR, Pyrrolidonyl aminopeptidase.

479. An 18 year old boy has complaints of fever, headache, sore throat, myalgias and headache. A few hours later sneezing and rhinorrhea develop. A diagnosis of Influenza is made. Regarding the virulence of this virus , antigenic shift is a term often used. What changes in the genome RNA causes this phenomenon?

a) point mutation
b) reassortment
c) deletion
d) translocation
e) transduction

Key b (if drift asked = mutation)


Drift	Shift
Minor change within subtype	Major change, new subtype
Point mutations	Exchange of gene segments
Occurs in A and B subtypes	Occurs in A subtypes only
May cause epidemics	May cause pandemic
Example: A/Fujian (H3N2) replaced A/ Panama (H3N2) in 2003-2004	Example: H3N2 replaced H2N2 in 1968


Genetic Shift & Drift

HYR 7

- Reassortment → Shift → Pandemics & Epidemics
- Mutations → Drift → Epidemics

StampOnStep1.com Copyright © McDaniel 7

480. A 3 year old girl is brought to the OPD by her mother in a state of severe distress. She is having shortness of breath, chest tightness , wheezing and cough. According to the mother, she has been having similar episodes over the past several weeks but this time around it wont resolve. After investigations a diagnosis of Asthma is made. Regarding this condition, What is the most potent mediator responsible for the early onset of her symptoms?

a) Leukotriene B4
b) Thromboxane
c) Serotonin
d) Histamine
e) Prostaglandin D 2

Key d

Histamine is a potent mediator involved in the early-phase response of asthma. When exposed to allergens, histamine is released from mast cells and basophils. It causes bronchoconstriction, increased mucus production, and vascular permeability, leading to symptoms like wheezing, coughing, and shortness of breath.

481. A 22 year old homeless person with a known drug abuse problem and multiple opportunistic infections has a positive PPD (purified protein) test. Which of the following is the most common way this infection is acquired?

a). Gastrointestinal tract
b). Genital tract
c). Nasal tract
d). Respiratory tract
e). Skin
Key d

482. Vibrio cholerae is worldwide in distribution and continues to expand as water sources become polluted. Which of the following best describes this organism?

a. Cause of gastroenteritis; reservoir in birds and mammals, optimal growth at 107.6° F(42*C).
b. Human pathogen, halophilic, lactose-negative, sucrose negative; causes gastrointestinal diseases primarily from ingestion of under-cooked seafood.
c. Human pathogen, halophilic , lactose postive, produces heat-labile, extracellular toxin,wound infection.
d. Organisms susceptible to acid; not an invasive organism
e. Urease-positive; cause of fetal distress in cattle.
Key d

- **Susceptibility to acid: V. cholerae is sensitive to acidic conditions, which is why it requires a large inoculum to survive the stomach's acidity and reach the intestines.**
- **Not invasive: V. cholerae is not invasive in the sense that it doesn't enter the bloodstream or tissues. Instead, it causes disease by producing a cholera toxin that disrupts the intestines' normal absorption and secretion processes, leading to diarrhea.**

483. A 17 year old man is hospitalized with trauma to the abdomen following a gang-related fight. He develops an intra- abdominal abscess, which is drained and sent to the laboratory. A mixture of gram-negative anerobes is detected. Which of the following microorganisms is the most likely and is also the most prevalent bacterium in the gut?

a). alpha-Hemolytic streptococci
b). Bacteriodes fragilis
c). Escherichia coli
d). Lactobacillus species
e). Staphylococcus epidermidis.
Key b

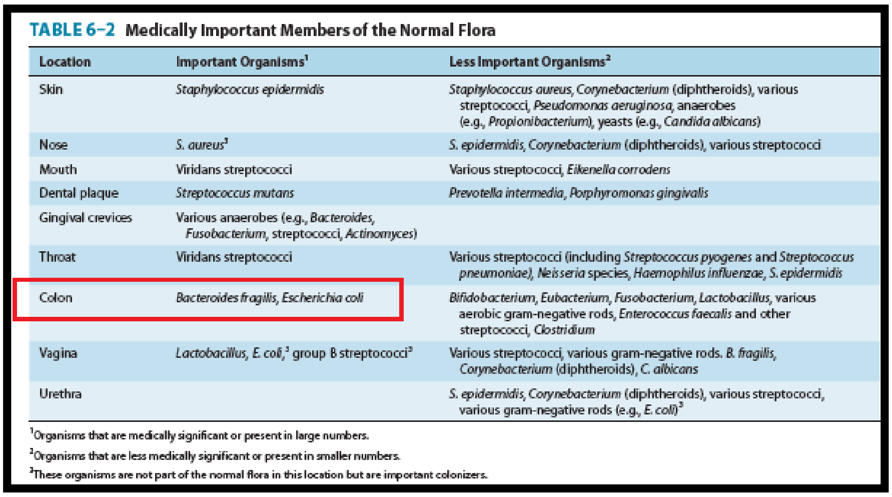


TABLE 6–2 Medically Important Members of the Normal Flora

Location	Important Organisms[1]	Less Important Organisms[2]
Skin	*Staphylococcus epidermidis*	*Staphylococcus aureus*, *Corynebacterium* (diphtheroids), various streptococci, *Pseudomonas aeruginosa*, anaerobes (e.g., *Propionibacterium*), yeasts (e.g., *Candida albicans*)
Nose	*S. aureus*[3]	*S. epidermidis*, *Corynebacterium* (diphtheroids), various streptococci
Mouth	Viridans streptococci	Various streptococci, *Eikenella corrodens*
Dental plaque	*Streptococcus mutans*	*Prevotella intermedia*, *Porphyromonas gingivalis*
Gingival crevices	Various anaerobes (e.g., *Bacteroides*, *Fusobacterium*, streptococci, *Actinomyces*)	
Throat	Viridans streptococci	Various streptococci (including *Streptococcus pyogenes* and *Streptococcus pneumoniae*), *Neisseria* species, *Haemophilus influenzae*, *S. epidermidis*
Colon	*Bacteroides fragilis*, *Escherichia coli*	*Bifidobacterium*, *Eubacterium*, *Fusobacterium*, *Lactobacillus*, various aerobic gram-negative rods, *Enterococcus faecalis* and other streptococci, *Clostridium*
Vagina	*Lactobacillus*, *E. coli*,[3] group B streptococci[3]	Various streptococci, various gram-negative rods. *B. fragilis*, *Corynebacterium* (diphtheroids), *C. albicans*
Urethra		*S. epidermidis*, *Corynebacterium* (diphtheroids), various streptococci, various gram-negative rods (e.g., *E. coli*)[3]

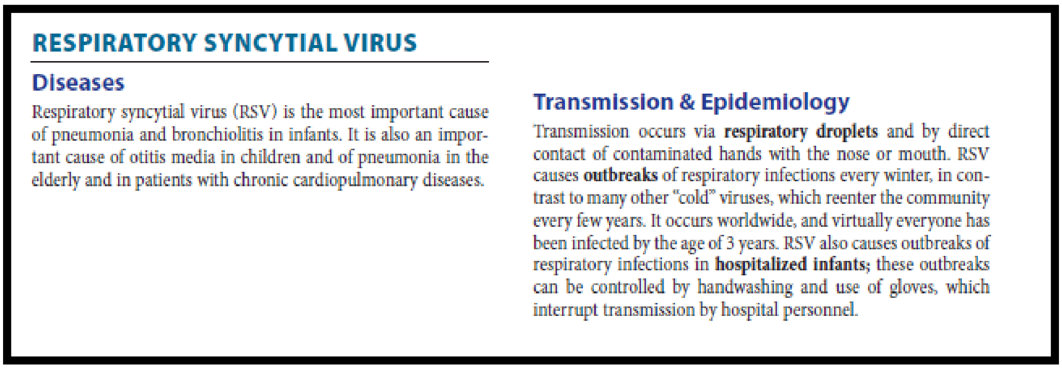
[1] Organisms that are medically significant or present in large numbers.

[2] Organisms that are less medically significant or present in smaller numbers.

[3] These organisms are not part of the normal flora in this location but are important colonizers.

484. Newborns are at risk of picking up dangerous germs from surroundings due to limited immune system. Which of the following viruses is the leading cause of bronchiolitis and community acquired pneumonia?

a). Adenovirus
b).Influenza virus
c).Measles virus
d). Parainfluenza virus
e). Respiratory syncytial virus
Key e



RESPIRATORY SYNCYTIAL VIRUS

Diseases

Respiratory syncytial virus (RSV) is the most important cause of pneumonia and bronchiolitis in infants. It is also an important cause of otitis media in children and of pneumonia in the elderly and in patients with chronic cardiopulmonary diseases.

Transmission & Epidemiology

Transmission occurs via **respiratory droplets** and by direct contact of contaminated hands with the nose or mouth. RSV causes **outbreaks** of respiratory infections every winter, in contrast to many other "cold" viruses, which reenter the community every few years. It occurs worldwide, and virtually everyone has been infected by the age of 3 years. RSV also causes outbreaks of respiratory infections in **hospitalized infants**; these outbreaks can be controlled by handwashing and use of gloves, which interrupt transmission by hospital personnel.

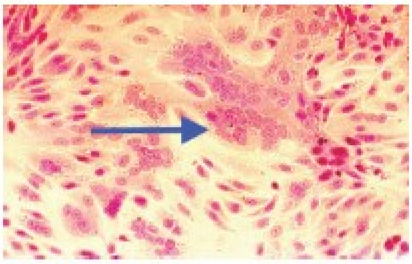


FIGURE 38–3 Multinucleated giant cells of respiratory syncytial virus (RSV). The blue arrow points to a multinucleated giant cell produced by RSV infection of fibroblasts in cell culture. (Used with permission: Photograph by Dr. L. Stannard. Copyright University of Cape Town, 2016.)

Important Properties

The genome RNA and nucleocapsid are those of a typical paramyxovirus (see Table 38–2). Its surface spikes are **fusion proteins**, not hemagglutinins or neuraminidases. The fusion protein causes cells to fuse, forming **multinucleated giant cells (syncytia)**, which give rise to the name of the virus (Figure 38–3).

Humans are the natural hosts of RSV. RSV has two serotypes, designated subgroup A and subgroup B. Antibody against the fusion protein neutralizes infectivity.

485. Varicella-zoster virus (VZV) is a mild, highly contagious disease of children, but may be severe in adults or immunocompromised individuals. Acyclovir (and similar products) can prevent the development of systemic disease in immunocompromised individuals, making laboratory diagnosis significant. Which of the following specimens is best for detection of VZV?

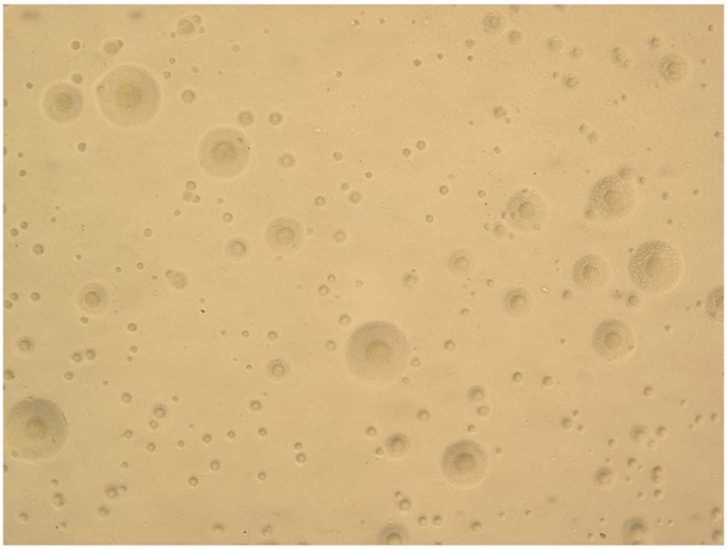
a). Blood
b). Cerebrospinal fluids
c). Cervical tissue
d). Skin
e). Synovial fluid.
Key d

Varicella-zoster virus (VZV) typically causes a rash, which is the most obvious clinical feature of the disease. The virus can be detected in skin lesions, specifically from vesicular fluid collected from the rash, which is the best specimen for diagnosis. This sample is used for viral culture, PCR, or direct fluorescent antibody (DFA) testing to confirm VZV infection.

486. Which one of the following types of organisms is NOT an obligate intracellular parasite and therefore can replicate on bacteriologic media?
(A) Chlamydia
(B) Mycoplasma
(C) Adenovirus
(D) Rickettsia
Key b

EATON AGAR !

Appearance of colonies of *Mycoplasma pneumoniae*



487. Tissue-degrading enzymes play an important role in the pathogenesis of several bacteria. Which one of the following is NOT involved in tissue or cell damage?
(A) Lecithinase of Clostridium perfringens
(B) Hyaluronidase of Streptococcus pyogenes

(C) M protein of Streptococcus pneumoniae
(D) Leukocidin of Staphylococcus aureus
Key c

- **Lecithinase of Clostridium perfringens (A): Lecithinase is a toxin that breaks down lecithin, a major component of cell membranes, causing cell and tissue damage. It plays a key role in the pathogenesis of gas gangrene.**
- **Hyaluronidase of Streptococcus pyogenes (B): Hyaluronidase breaks down hyaluronic acid, a component of connective tissue, facilitating the spread of infection by allowing bacteria to invade tissues more easily.**
- **M protein of Streptococcus pneumoniae (C): While M protein is important in bacterial virulence, it primarily helps the bacteria evade the immune system by preventing phagocytosis, rather than causing direct tissue or cell damage. M protein does not degrade tissue or cells.**
- **Leukocidin of Staphylococcus aureus (D): Leukocidin is a toxin that destroys white blood cells (particularly neutrophils), contributing to tissue damage and inflammation in infections like abscesses and necrotizing fasciitis.**

488. Which one of the following organisms is the MOST frequent bacterial cause of pharyngitis?
(A) Staphylococcus aureus
(B) Streptococcus pneumoniae
(C) Streptococcus pyogenes
(D) Neisseria meningitides
Key c

489. Which of the following components is present in gram positive bacteria but not in gram negative bacteria,
a) Peptidoglycan
b) Capsule
c) Flagella
d) Teichoic acid
e) Diaminopimelic acid
Key d

490. Most pathogenic microorganisms grow best in the laboratory when cultures are incubated at
a) 15 -20 °C
b) 20 -30 °C
c) 30 -37 °C
d) 38 -50 °C
e) 50 -55 °C
Key c

491. The form of genetic exchange in which donor DNA is introduced to the recipient by a bacterial virus is
a) Transformation
b) Conjugation
c) Transfection
d) Transduction
e) Horizontal transfer
Key d

492. Certain microorganisms are never considered to be member of the normal flora. They are always considered to be pathogens. Which one of the following organisms fits into that category.
a) Streptococcus pneumoniae
b) Mycobacterium tuberculosis
c) Staphylococcus aureus
d) Neisseria meningitides
e) Escherichia coli
Key b

493. A group of six children under 8 years of age live in semitropical country. Each of the children had several yellow crusted skin lesions. Diagnosis of impetigo was made. The lesions are predominant on face and hands. Which of the following organism is likely cause of the lesion,

a) Esherichia coli
b) Chlamydia trachomatis
c) Staphylococcus aureus
d) Streptococcus pneumoniae
e) Bacillus anthracis

Key c

Always remember:

Impetigo =

Staphylococcus aureus

Streptococcus pyogenes

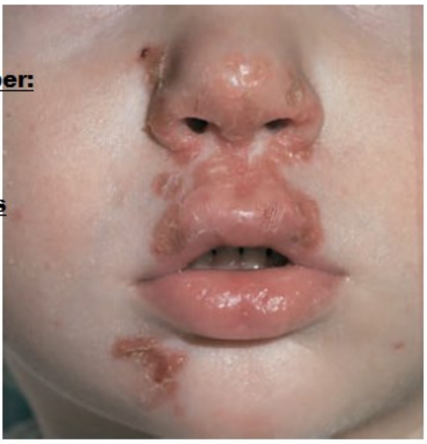


FIGURE 77–2 Classic nonbullous impetigo. Note lesions with a "honey-colored" crust around the nose and mouth. (Reproduced with permission from Wolff K, Johnson, eds. *Fitzpatrick's Color Atlas & Synopsis of Clinical Dermatology*. 6th ed. New York, NY: McGraw-Hill; 2009.)

494. A 5 year old girl attended a birthday party at a local fast food restaurant. About 48 hours later she developed cramping abdominal pain, low grade fever and had five episodes of loose, bloody stools. She was taken to ta a local emergency room. On examination she had a temperature of 38 °C, she was hypotensive and tachycardic.The abdominal examination revealed tenderness in the lower quadrant. Laboratory workup showed serum creatinine 2mg/dl, HB 8 mg/dl, thrombocytopenia and evidence of hemolysis. Which is the most likely pathogencausing this child's illness,

a) Escherichia coli O157:H7
b) Salmonella typhi
c) Enteropathogenic Escherichia coli
d) Edwardsiella tarda
e) Plesiomonas shigelloides

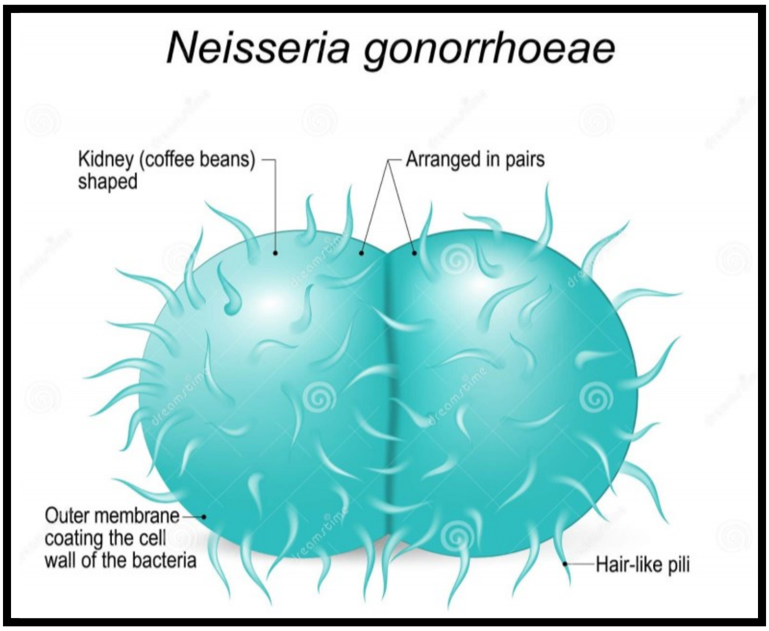
Key a

TTP	HUS
Pentad	Tetrad
• Hemolytic anemia with RBC fragmentation	• Hemolytic anemia with RBC fragmentation
• Renal dysfunction	• Acute renal failure
• Thrombocytopenia (35,000)	• Thrombocytopenia (95,000)
• Severe CNS symptoms	
• Fever	

495. Which of the following cell components produced by Neisseria gonorrhea is responsible for attachment to the host cell

a) Lipopolysaccharide
b) Pilli
c) IgA protease
d) Outer membrane porin proteins
e) Iron binding proteins

Key b


Neisseria gonorrhoeae
Kidney (coffee beans) shaped
Arranged in pairs
Outer membrane coating the cell wall of the bacteria
Hair-like pili

496. A 17 year old boy, known case of cystic fibrosis, presented to opd with increase in frequency of cough and production of mucoid sputum. A sputum culture revealed mucoid colonies with fruity odour. Microscopy showed gram negative bacilli. Oxidise test was positive. Which of the following is most likely the cause of his illness,

a) Klebsiella pneumoniae
b) Pseudomonas aeruginosa
c) Staphylococcus aureus
d) Streptococcus pneumoniae
e) Burkholderia cepacia

Key b

Fruity odour due to = 2-aminoacetophenone
For micro people

497. Which one of following is the selective media for Vibrio cholera.

a) Bismuth sulphite agar
b) Potassium tellurite agar
c) Deoxycholate agar
d) TCBS
e) CLED

Key d

498. Moist heat sterilization, usually autoclaving is most frequently used method of sterilization. Which one of the following statements regarding autoclave is correct.

a) Pressure 15lbs/ temp 121°C, time 15-20 minutes
b) Pressure 30 lbs/ temp 121°C, time 5-10 minutes
c) Pressure 20lbs/ temp 100°C, time 10-15 minutes
d) Pressure 10 lbs, temp 150°C, time 15-20 minutes

Key a

499. 62 years old male was admitted in tertiary care hospital with diabetic foot. He was given multiple antibiotics. On 6th day of admission he developed watery diarrhea. Greyish yellow adherent membrane was seen on mucosal surface of his colon. Which of the following antibiotics could be most likely responsible for this infection?

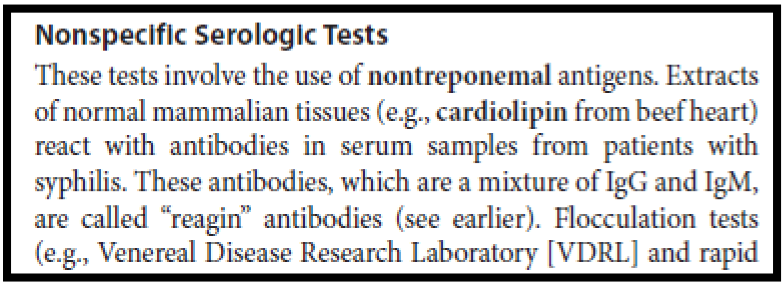
a. Amikacin
b. 3^{rd} generation cephalosporins
c. Gentamicin
d. Doxycycline
e. 1st generation cephalosporins
Key b

500. A 35 years old patient with recently diagnosed syphilis was given injection benzathine penicillin. He developed fever, chills, myalgias and other flu like symptoms a few hours after antibiotic administration. This specific response of body is called

a. Acute hemolytic transfusion reaction
b. Bacterial sepsis
c. Jarisch- Herxheimer reaction
d. Prozone phenomenon
e. Weil- felix test
Key c

501. Non-specific test of syphilis serology use antigen which contain

a. Cardiolipin from beef heart
b. Cardiolipin, lecithin and cholesterol
c. Recombinant Treponema pallidum antigens
d. Treponema pallidum lysate
e. Treponema pallidum antigens
Key b



Nonspecific Serologic Tests

These tests involve the use of **nontreponemal** antigens. Extracts of normal mammalian tissues (e.g., **cardiolipin** from beef heart) react with antibodies in serum samples from patients with syphilis. These antibodies, which are a mixture of IgG and IgM, are called "reagin" antibodies (see earlier). Flocculation tests (e.g., Venereal Disease Research Laboratory [VDRL] and rapid

The principle of cardiolipin-lecithin-cholesterol-based tests, used in non-treponemal syphilis serology (e.g., VDRL, RPR), involves detecting reagin antibodies in the patient's serum. These antibodies, formed in response to tissue damage and lipid release during Treponema pallidum infection, react with an artificial antigen mixture of cardiolipin, lecithin, and cholesterol. When the patient's serum is mixed with this antigen, binding of reagin antibodies leads to visible clumping or flocculation, which can be observed microscopically (VDRL) or macroscopically with added charcoal particles (RPR).

502. 32 years old nursing assistant who had to go abroad came for his syphilis serology. He had no history of exposure or contact. In your lab his VDRL was found positive but TPHA and EIA was negative. When asked further he told that his VDRL and TPHA both were negative 1 month back. Which of the following could be most likely cause for his acute false positive VDRL.

a. Autoimmune disease
b. Antiphospholipid syndrome
c. Rheumatoid arthritis
d. SLE
e. Viral illness
Key e

503. Haemophilus influenzae vaccine is part of EPI (Expanded program of immunization) which is conjugated vaccine which contains capsular polysaccharide of H.influenzae conjugated to diphtheria toxoid. This vaccine contains following serotype of H.influenzae:

a. Serotype a
b. Serotype b
c. Serotype c
d. Serotype d

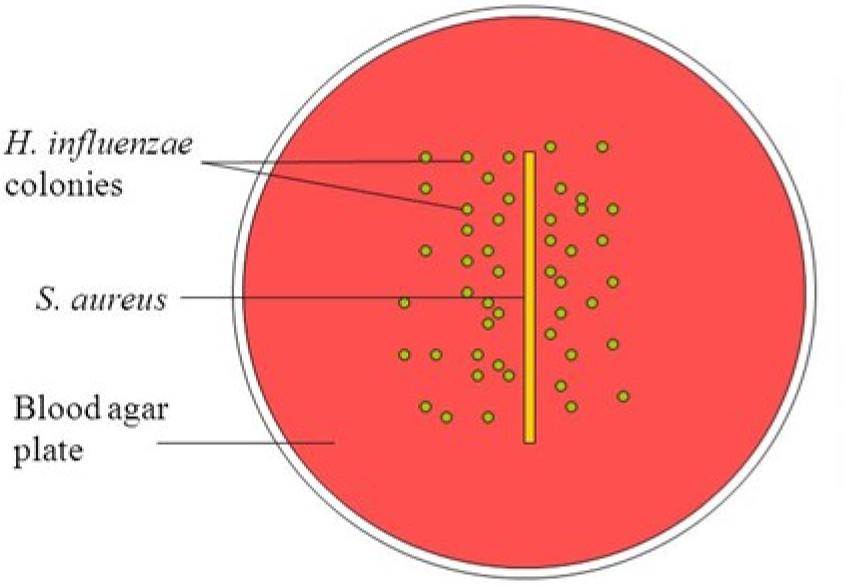
e. Serotype e

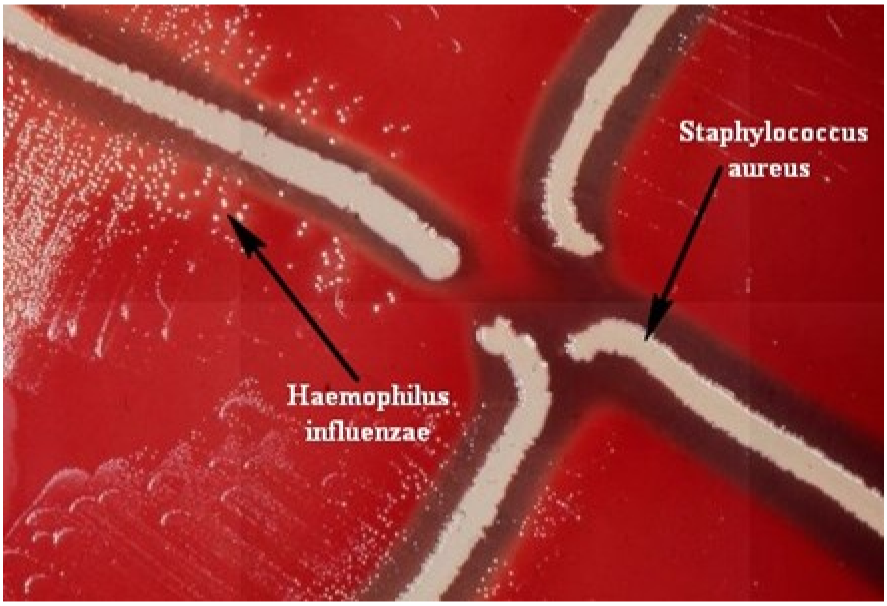
Key b

504. Most of the strains of H.influenzae do not grow on blood agar but when H.influenzae may be seen growing on sheep blood agar very close to hemolytic Staphylococcus aureus, this is known as Satellite phenomenon. H.influenzae requires following for its growth

a. Factor V
b. Factor X
c. Both Factor V and X
d. Neither Factor X nor Factor V
e. Lactose c

Key c


H. influenzae colonies
S. aureus
Blood agar plate


Staphylococcus aureus
Haemophilus influenzae

505. 42 years old male had road traffic accident leading to facial trauma which broke his jaw. Later on he developed hard, non-tender swelling along with sinus tract. Pus from sinus tract contained yellow sulfur granules. Gram stain showed branching gram positive rods. Which of the following is most likely agent

a. Actinomyces israelli
b. Nocardia
c. Mycobacterium fortuitum
d. Mycobacterium abscessus
e. Mycobacterium chelonae

Key a

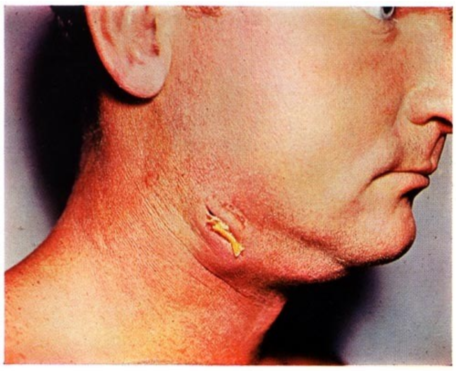
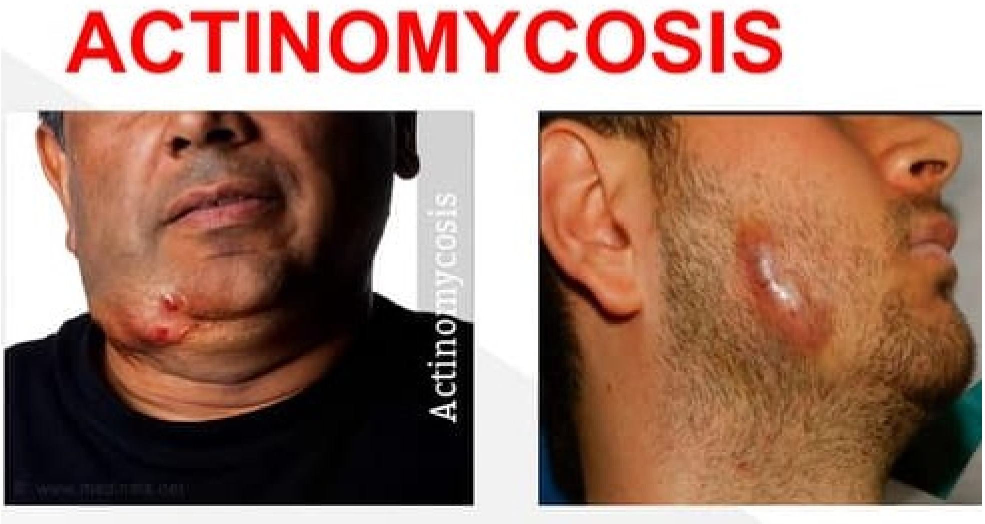


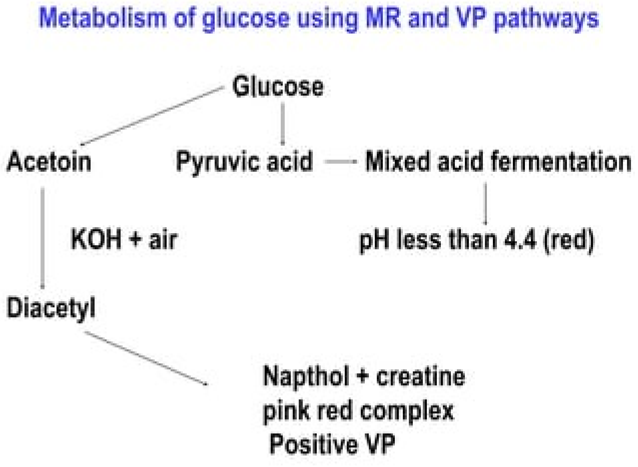
FIGURE 1.—Actinomycosis, jaw, observed at Letterman General Hospital, San Francisco, Calif., in a sergeant who had punctured the floor of his mouth with a weed stem while picking his teeth.


ACTINOMYCOSIS
Actinomycosis

506. Listeria monocytogenes is a gram positive rod, non-spore forming and it is an important cause of neonatal meningitis. Which of the following is typical biochemical reaction of the microorganism?

a. Ecsulin Hydolysis negative
b. H_2S gas production positive
c. Indole positive
d. MR and VP positive
e. Oxidase positive

Key d


Metabolism of glucose using MR and VP pathways
Glucose
Acetoin
Pyruvic acid
Mixed acid fermentation
KOH + air
pH less than 4.4 (red)
Diacetyl
Napthol + creatine
pink red complex
Positive VP

The Methyl Red (MR) test detects mixed acid fermentation by measuring acid production in glucose fermentation, turning red at a pH <4.4. The Voges-Proskauer (VP) test detects acetoin production from glucose fermentation, producing a red color after adding Barritt's reagents. Both are part of the IMViC tests for Enterobacteriaceae.

507. 18 year old college student went to restaurant on weekend and ate hamburger and developed Bloody diarrhea.It was established that Shiga toxin is most important virulence factor in pathogenesis of his disease. What couldbe most likely disease agent?

a. Enteroaggregative E.coli
b. Enterohemorrhagic E.coli
c. Enteroinvasive E.coli
d. Enteropathogenic E.coli
e. Enterotoxigenic E.coli

Key b

508. Acinetobacter baumannii is a significant threat because of its multidrug resistance and being most important cause of nosocomial infections. Which of the following is false about the organism?

a. Important cause of ventilator associated pneumonia
b. It is catalase positive
c. It has darting motility
d. It is oxidase negative
e. Transmission is by person to person contact

Key c

509. Shigella is gram negative rod belongs to family Enterobacteriaceae is important cause of Bloody diarrhea. Whichof the following is moderate to high selectivity medium for Shigella?

a. Blood agar
b. EMB agar
c. MacConkey agar
d. Selenite F
e. XLD agar

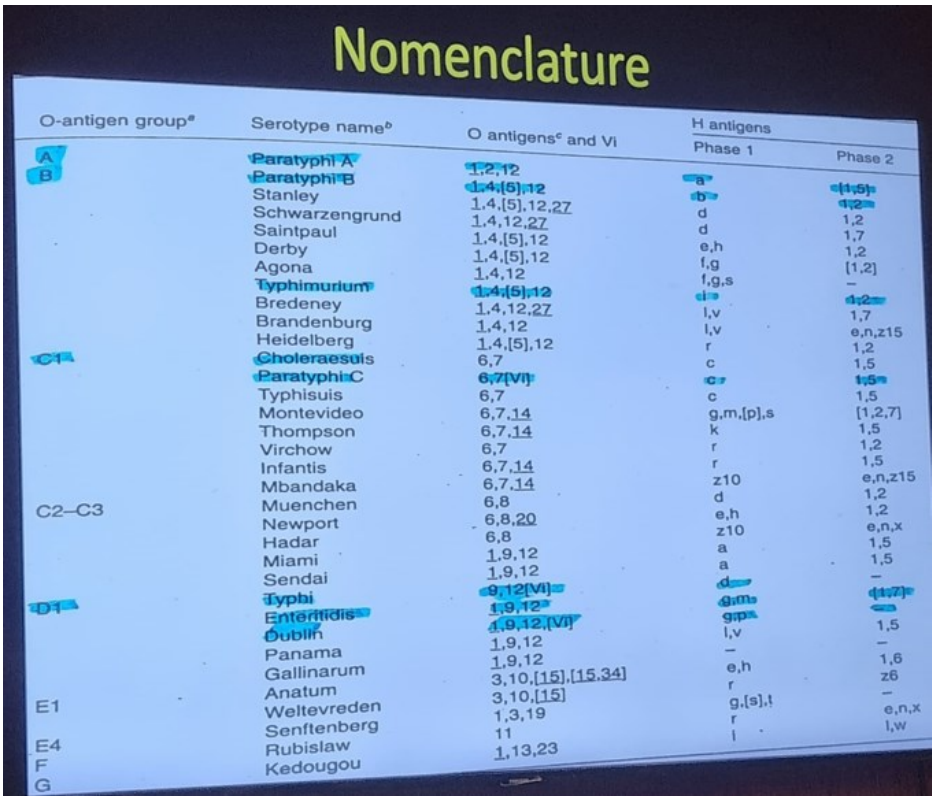
Key e

For Salmonella:
Low selectivity = MAC and EMB
Intermediate selectivity = XLD, DCA, SS agar, HE agar, Chromagar salmonella
High selectivity = Bismuth sulfite agar and brilliant green agar

510. Salmonella enterica is a gram negative rod which is cause of enteric fever and gastroenteritis. Which of the following is correct about its Vi antigen?

a. It is flagellar antigen
b. It may mask flagellar antigen
c. It may be found in Salmonella Typhi
d. It may be found in Salmonella Typhi and Salmonella Dublin
e. It may be found in Salmonella Typhi , Salmonella Paratyphi B and Salmonella Dublin

Key d



Nomenclature

O-antigen group^a	Serotype name^b	O antigens^c and Vi	H antigens Phase 1	H antigens Phase 2
A	Paratyphi A	1,2,12	a	[1,5]
B	Paratyphi B	1,4,[5],12	b	1,2
	Stanley	1,4,[5],12,27	d	1,2
	Schwarzengrund	1,4,12,27	d	1,7
	Saintpaul	1,4,[5],12	e,h	1,2
	Derby	1,4,[5],12	f,g	[1,2]
	Agona	1,4,12	f,g,s	—
	Typhimurium	1,4,[5],12	i	1,2
	Bredeney	1,4,12,27	l,v	1,7
	Brandenburg	1,4,12	l,v	e,n,z15
	Heidelberg	1,4,[5],12	r	1,2
C1	Choleraesuis	6,7	c	1,5
	Paratyphi C	6,7[Vi]	c	1,5
	Typhisuis	6,7	c	1,5
	Montevideo	6,7,14	g,m,[p],s	[1,2,7]
	Thompson	6,7,14	k	1,5
	Virchow	6,7	r	1,2
	Infantis	6,7,14	r	1,5
	Mbandaka	6,7,14	z10	e,n,z15
C2–C3	Muenchen	6,8	d	1,2
	Newport	6,8,20	e,h	1,2
	Hadar	6,8	z10	e,n,x
	Miami	1,9,12	a	1,5
	Sendai	1,9,12	a	1,5
D1	Typhi	9,12[Vi]	d	—
	Enteritidis	1,9,12	g,m	[1,7]
	Dublin	1,9,12,[Vi]	g,p	—
	Panama	1,9,12	l,v	1,5
	Gallinarum	1,9,12	—	—
E1	Anatum	3,10,[15],[15,34]	e,h	1,6
	Weltevreden	3,10,[15]	r	z6
E4	Senftenberg	1,3,19	g,[s],t	—
F	Rubislaw	11	r	e,n,x
G	Kedougou	1,13,23	i	l,w

511. Infective form of strongyloides is

a) eggs

b) rhabditiform larva

c) filariform larvae

d) cercariae larva

Key c

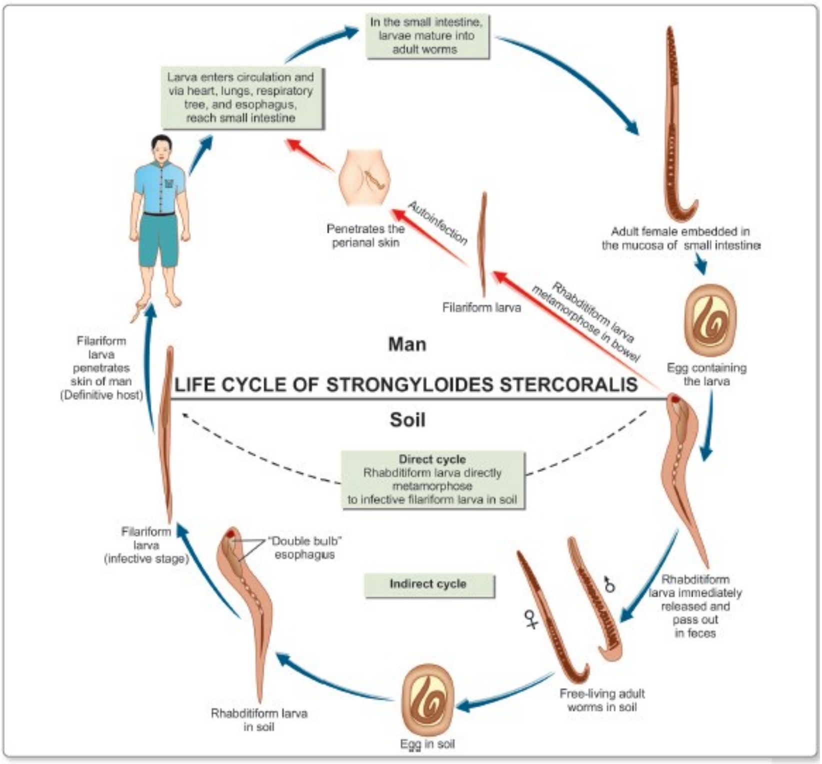
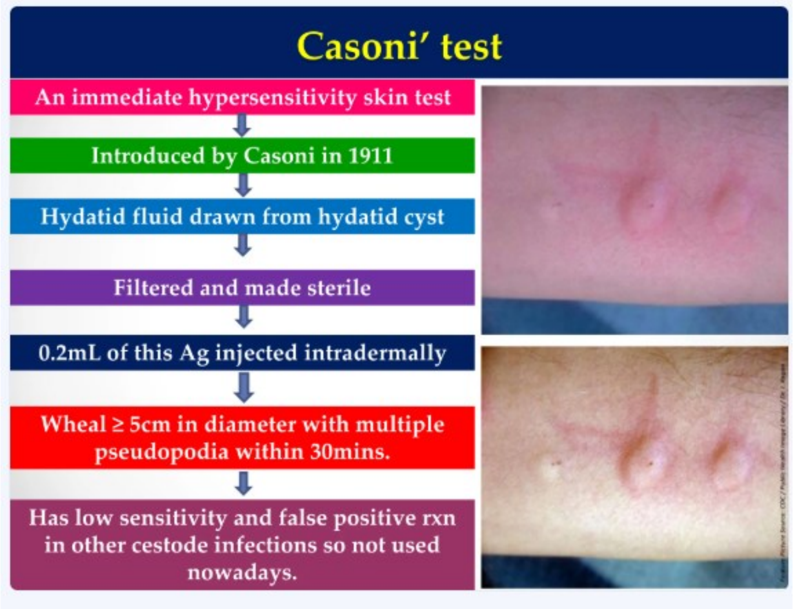

In the small intestine, larvae mature into adult worms
Larva enters circulation and via heart, lungs, respiratory tree, and esophagus, reach small intestine
Autoinfection
Penetrates the perianal skin
Adult female embedded in the mucosa of small intestine
Filariform larva
Rhabditiform larva metamorphose in bowel
Egg containing the larva
Filariform larva penetrates skin of man (Definitive host)
Man
LIFE CYCLE OF STRONGYLOIDES STERCORALIS
Soil
Direct cycle
Rhabditiform larva directly metamorphose to infective filariform larva in soil
Filariform larva (infective stage)
"Double bulb" esophagus
Indirect cycle
♂
♀
Rhabditiform larva immediately released and pass out in feces
Free-living adult worms in soil
Rhabditiform larva in soil
Egg in soil

Fig. 17.4: Life cycle of *Strongyloides stercoralis*

512. Which skin test is used for dignosis of hydatid disease

a) casonis test
b) shick test
c) mick test
d) tuburculin test
Key a



Casoni’ test

An immediate hypersensitivity skin test

Introduced by Casoni in 1911

Hydatid fluid drawn from hydatid cyst

Filtered and made sterile

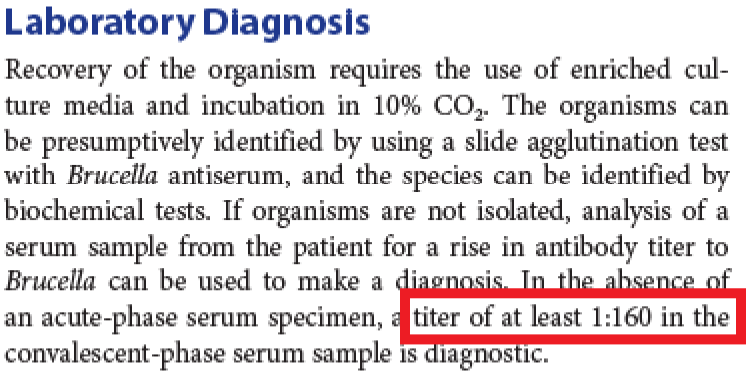
0.2mL of this Ag injected intradermally

Wheal ≥ 5cm in diameter with multiple pseudopodia within 30mins.

Has low sensitivity and false positive rxn in other cestode infections so not used nowadays.

513. The chemoprophylaxis of brucellosis include
a) combination of doxycycline and rifampicin for 3weeeks
b) doxycycline only for 3 weeks
c) doxycycline,rifampicin and gentamycin for 3 weeks
d) combination of doxycycline and rifampicin for 6 weeks
Key d

514. Which of the following titre indicates active brucellosis in endemic areas
a) 1:160
b) 1:80
c) 1:40
d) 1:20
Key a



Laboratory Diagnosis

Recovery of the organism requires the use of enriched culture media and incubation in 10% CO_2. The organisms can be presumptively identified by using a slide agglutination test with *Brucella* antiserum, and the species can be identified by biochemical tests. If organisms are not isolated, analysis of a serum sample from the patient for a rise in antibody titer to *Brucella* can be used to make a diagnosis. In the absence of an acute-phase serum specimen, a titer of at least 1:160 in the convalescent-phase serum sample is diagnostic.

515. Toxoplasmosis in fetus can be confirmed by
a) IgM antibodies in mother
b) IgM antibodies in fetus
c) IgG antibodies in mother
d) IgG antibodies in fetus
Key b

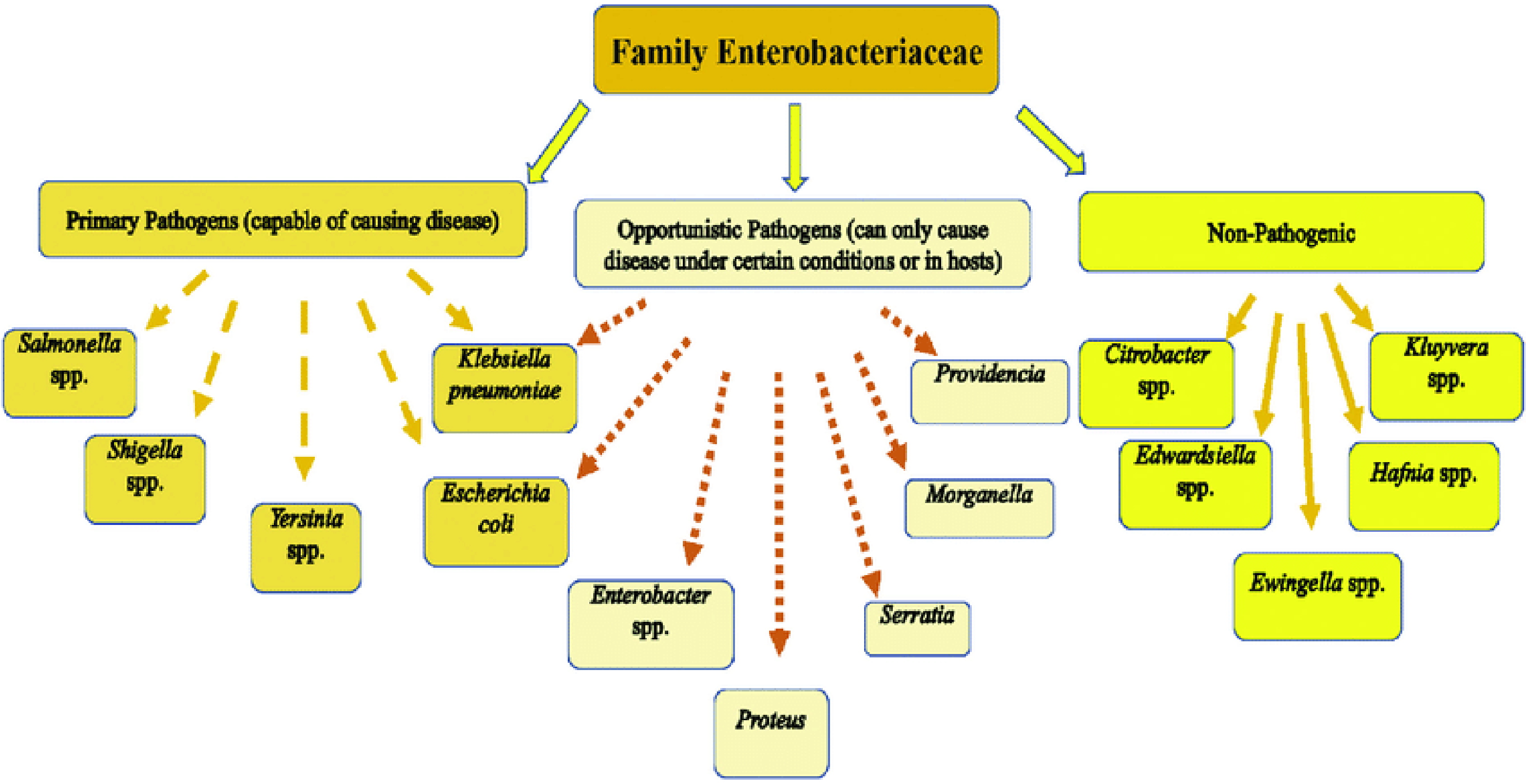
Detection of IgM antibodies in the fetus is diagnostic of congenital toxoplasmosis because IgM antibodies cannot cross the placenta and must be produced by the fetus in response to infection.

- **IgM antibodies in the mother indicate recent infection but do not confirm fetal involvement.**
- **IgG antibodies in the mother or fetus may indicate past infection, maternal immunity, or passive transfer of maternal IgG, which crosses the placenta.**

516. All enterobacteriaceae share all of the following characteristics except:

a) ferment glucose
b) oxidase positive
c) Rod shaped (bacilli)
d) Reduce nitrates to nitrites
e) gram negative

Key b


Family Enterobacteriaceae
Primary Pathogens (capable of causing disease)
Opportunistic Pathogens (can only cause disease under certain conditions or in hosts)
Non-Pathogenic
Salmonella spp.
Shigella spp.
Yersinia spp.
Klebsiella pneumoniae
Escherichia coli
Enterobacter spp.
Proteus
Serratia
Morganella
Providencia
Citrobacter spp.
Edwardsiella spp.
Ewingella spp.
Hafnia spp.
Kluyvera spp.

517. Which of the following is not transmitted by ticks?

a) Rocky mountain spotted fever
b) Q fever
c) Ehrichiosis
d) Rickettsia rickettsii

Key b

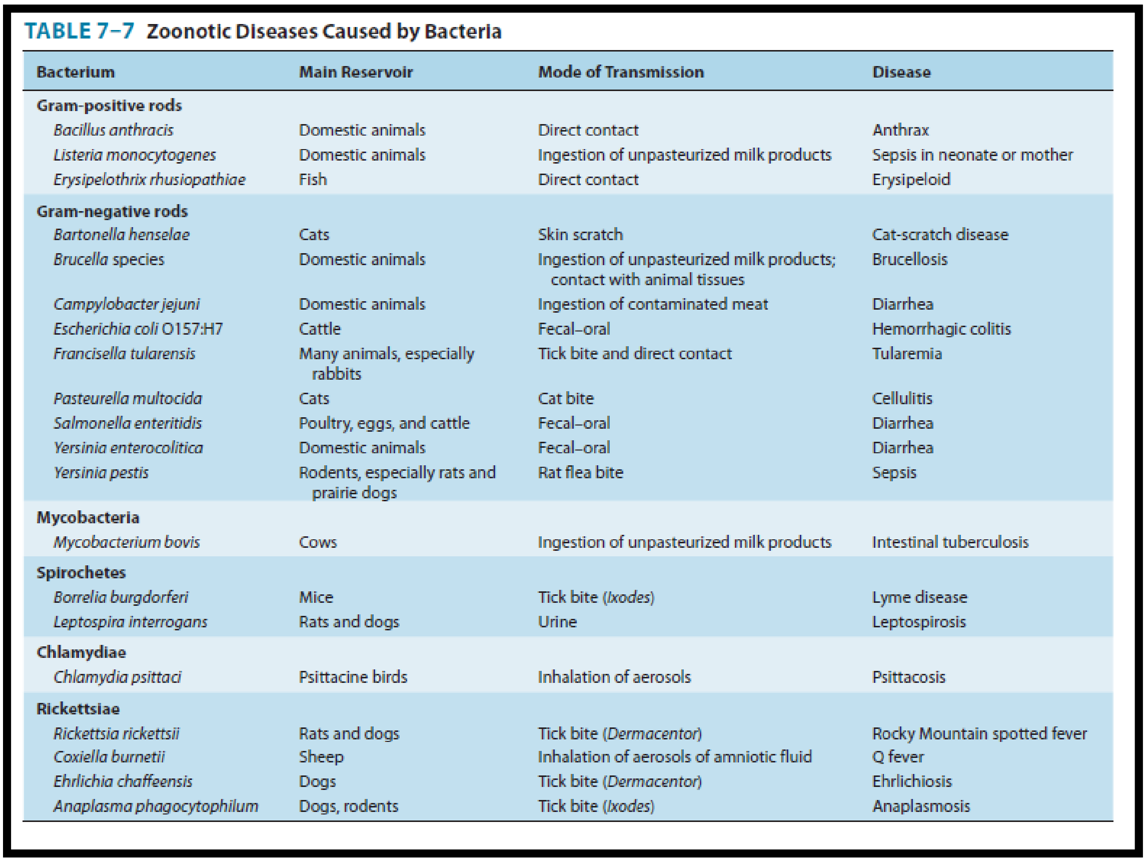


TABLE 7–7 Zoonotic Diseases Caused by Bacteria

Bacterium	Main Reservoir	Mode of Transmission	Disease
Gram-positive rods			
Bacillus anthracis	Domestic animals	Direct contact	Anthrax
Listeria monocytogenes	Domestic animals	Ingestion of unpasteurized milk products	Sepsis in neonate or mother
Erysipelothrix rhusiopathiae	Fish	Direct contact	Erysipeloid
Gram-negative rods			
Bartonella henselae	Cats	Skin scratch	Cat-scratch disease
Brucella species	Domestic animals	Ingestion of unpasteurized milk products; contact with animal tissues	Brucellosis
Campylobacter jejuni	Domestic animals	Ingestion of contaminated meat	Diarrhea
Escherichia coli O157:H7	Cattle	Fecal–oral	Hemorrhagic colitis
Francisella tularensis	Many animals, especially rabbits	Tick bite and direct contact	Tularemia
Pasteurella multocida	Cats	Cat bite	Cellulitis
Salmonella enteritidis	Poultry, eggs, and cattle	Fecal–oral	Diarrhea
Yersinia enterocolitica	Domestic animals	Fecal–oral	Diarrhea
Yersinia pestis	Rodents, especially rats and prairie dogs	Rat flea bite	Sepsis
Mycobacteria			
Mycobacterium bovis	Cows	Ingestion of unpasteurized milk products	Intestinal tuberculosis
Spirochetes			
Borrelia burgdorferi	Mice	Tick bite (*Ixodes*)	Lyme disease
Leptospira interrogans	Rats and dogs	Urine	Leptospirosis
Chlamydiae			
Chlamydia psittaci	Psittacine birds	Inhalation of aerosols	Psittacosis
Rickettsiae			
Rickettsia rickettsii	Rats and dogs	Tick bite (*Dermacentor*)	Rocky Mountain spotted fever
Coxiella burnetii	Sheep	Inhalation of aerosols of amniotic fluid	Q fever
Ehrlichia chaffeensis	Dogs	Tick bite (*Dermacentor*)	Ehrlichiosis
Anaplasma phagocytophilum	Dogs, rodents	Tick bite (*Ixodes*)	Anaplasmosis

518. Which of the following best describes the mode of action of endotoxin?

a) Degrades lecithin in cell membranes
b) Inactivates elongation factor 2
c) Blocks release of acetylcholine
d) causes the release of tumor necrosis factor
Key d

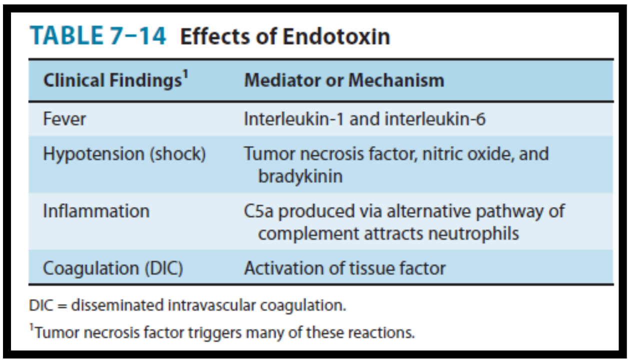


TABLE 7–14 Effects of Endotoxin

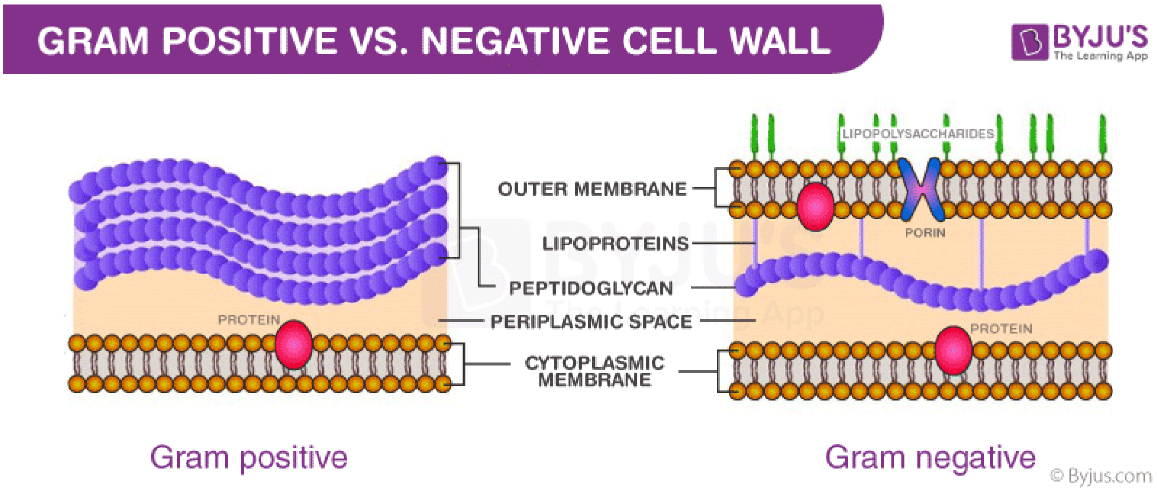
Clinical Findings[1]	Mediator or Mechanism
Fever	Interleukin-1 and interleukin-6
Hypotension (shock)	Tumor necrosis factor, nitric oxide, and bradykinin
Inflammation	C5a produced via alternative pathway of complement attracts neutrophils
Coagulation (DIC)	Activation of tissue factor

DIC = disseminated intravascular coagulation.

[1] Tumor necrosis factor triggers many of these reactions.

519. In the Gram stain, the decolourisation of gram-negative bacteria by acetone-alcohol is most closely related to:

a) Proteins encoded by F plasmids
b) Lipids in the outer cell membrane
c) 70S ribosomes
d) Branched polysaccharides in the capsule
Key b


GRAM POSITIVE VS. NEGATIVE CELL WALL
BYJU'S
The Learning App
LIPOPOLYSACCHARIDES
OUTER MEMBRANE
PORIN
LIPOPROTEINS
PEPTIDOGLYCAN
PERIPLASMIC SPACE
PROTEIN
PROTEIN
CYTOPLASMIC MEMBRANE
Gram positive
Gram negative
© Byjus.com

The acetone-alcohol decolorizer dissolves the outer lipid membrane, making the peptidoglycan layer more permeable, causing the crystal violet-iodine complex to leak out. This results in the bacteria appearing pink after counterstaining with safranin.

520. Daisy head colony is associated with

A. Mycobacterium tuberculosis

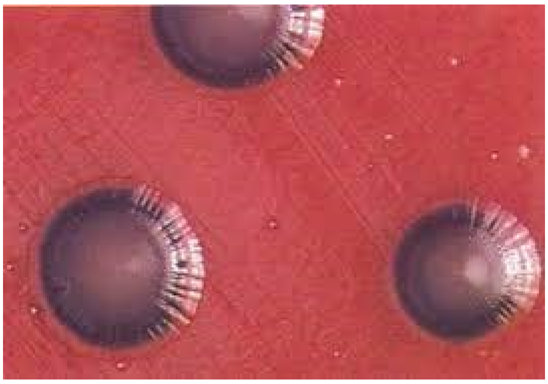
B. Corynebacterium diphtheriae

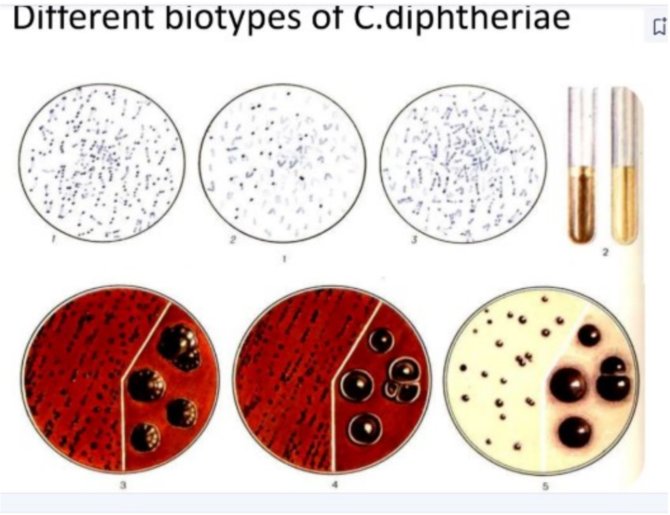
C. Clostridium tetanI

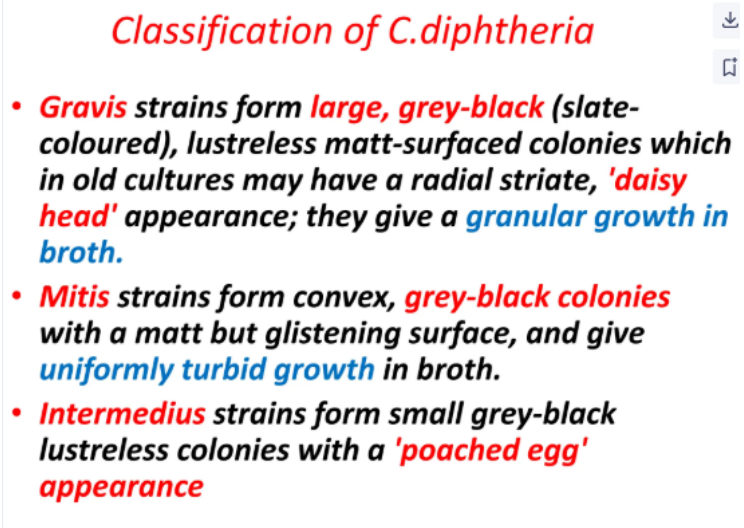
D. None of these

Correct :b

These colonies have a "daisy-like" appearance with a central elevated portion surrounded by a more flat, spreading edge. This distinctive colony morphology is observed on selective media like Loeffler's medium or Tellurite agar.

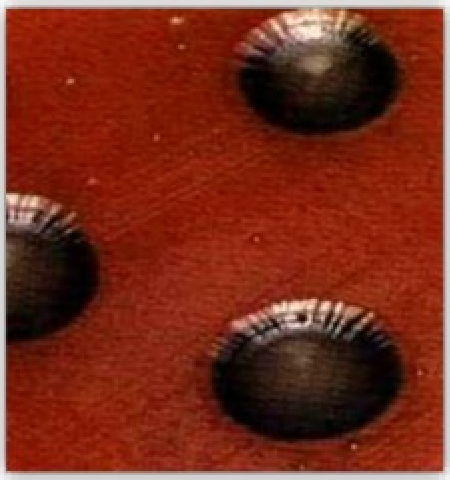



Different biotypes of C.diphtheriae
1
2
3
1
2
3
4
5

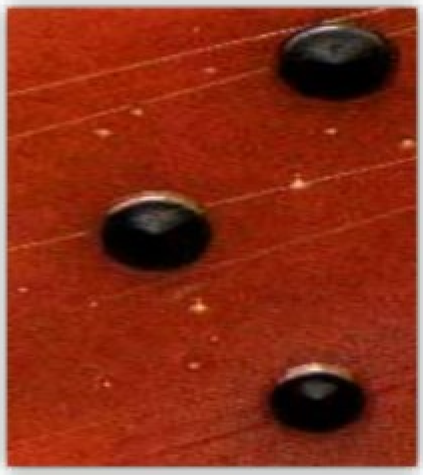


Classification of C.diphtheria

- **Gravis** strains form **large, grey-black** (slate-coloured), lustreless matt-surfaced colonies which in old cultures may have a radial striate, **'daisy head'** appearance; they give a **granular growth in broth.**
- **Mitis** strains form convex, **grey-black colonies** with a matt but glistening surface, and give **uniformly turbid growth** in broth.
- **Intermedius** strains form small grey-black lustreless colonies with a **'poached egg' appearance**



Gravis variant



Mitis variant

521. 8 years girl playing in a slowly moving stream when she cut her foot on a sharp object. 3 days later she was brought in ER because of pain, swelling and pus discharge from the site. Most likely cause is

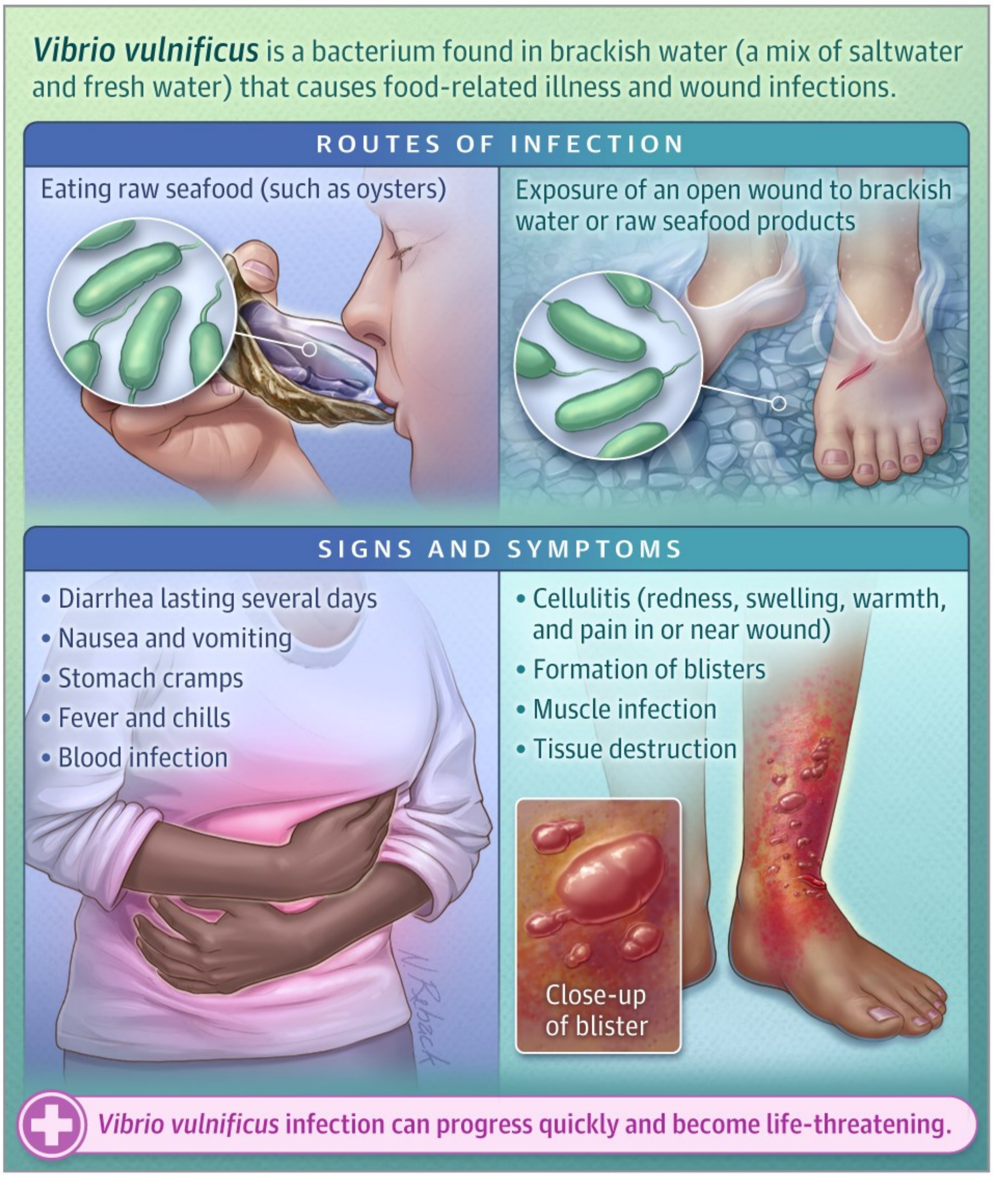
A. Vibrio vulnificus
B. E.coli
C. Proteus mirabills
D. Aeromonas hydrophilia
E. Salmonella typhimurium

Key = A (But I think D > A)

IN MY OPINION KEY SHOULD BE "D"

☐ **The girl was playing in a freshwater stream, which is a common habitat for *Aeromonas hydrophila*. This bacterium thrives in aquatic environments such as streams, ponds, and rivers.**
☐ **WHY I'M NOT PREFERRING VIBRIO = more associated with exposure to seawater or brackish water, not**

freshwater. It also commonly involves predisposing factors like liver disease or immunocompromised status.



Vibrio vulnificus is a bacterium found in brackish water (a mix of saltwater and fresh water) that causes food-related illness and wound infections.

ROUTES OF INFECTION

Eating raw seafood (such as oysters)

Exposure of an open wound to brackish water or raw seafood products

SIGNS AND SYMPTOMS

- Diarrhea lasting several days
- Nausea and vomiting
- Stomach cramps
- Fever and chills
- Blood infection

- Cellulitis (redness, swelling, warmth, and pain in or near wound)
- Formation of blisters
- Muscle infection
- Tissue destruction

Vibrio vulnificus infection can progress quickly and become life-threatening.

522. Infections caused by anaerobes are
A. Usually confined to the abdomen
B. Never seen in lung because of its excellent blood supply
C. Mixed
D. Rapidly progressive
Correct :c

523. Creutzfeldt-Jacob disease is caused by
A. JC virus
B. Pumula virus
C. Prions
D. SV 40 virus
Correct : c

524. A 40 year old underwent total shoulder arthroplasty after a road traffic accident. Two weeks later, she developed fever and shoulder pain. The wound was opened again and a biopsy of shoulder capsule was taken. Biopsy revealed growth only in anaerobic bottle after 5 days of incubation. The isolate was Gram positive, non spore forming rod which was catalase and indole positive. What is the most likely organism?

A: Bifdobaterium
B: Corynebacterium spp
C: Propionibacterum acnes

D: Eubacterium
E: Actinomyces

KEY: C

The most likely organism is Propionibacterium acnes (now classified as Cutibacterium acnes), which is a Gram-positive, non-spore-forming rod. It is catalase positive and indole positive, which fits the description provided. P. acnes is an anaerobic bacterium commonly associated with post-surgical infections, especially in orthopedic procedures like shoulder arthroplasty. It can be part of the normal skin flora and often causes chronic infections in deeper tissues following surgery.

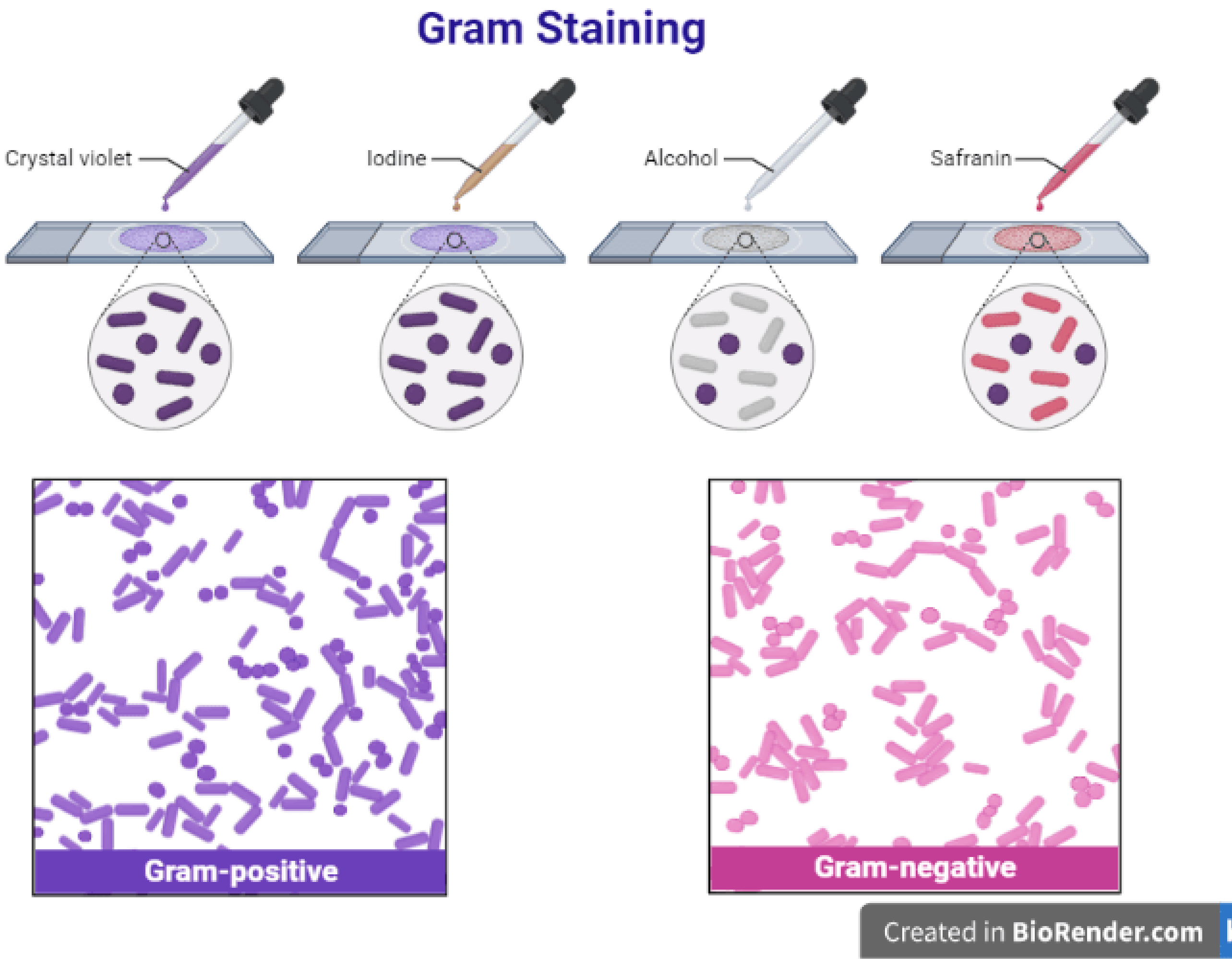
525. Chocolate agar is example of:
a. Non-selective media
b. Differential media
c. Enriched media
d. Selective media.
KEY: c

526. Which of the listed antimicrobials act on cell wall biosynthesis?
a. B-lactoms & glycopeptides
b. Tetracycline & streptomycin
c. Macrolides
d. Quinolones
KEY: a

527. A patient is drag with active T.B and is admitted in hospital. What type of precautions above & beyond mended precautions? This patient be placed on:
a. Contract precautions
b. Droplet precautions
c. Air borne precautions
d. Transmission based precautions
KEY: c

528. Strep pyogen is?
a. α- haemolytic
b. β- haemolytic
c. ϒ- haemolytic
d. all of the above
KEY: b

529. Which of the following is used as mordant in gram staining.
a. Acetone iodine
b. Gram iodine
c. Carbol fuchsin
d. Safranin
KEY: b



530. An 80 yr old female is suffering from UTI (Urinary Tract Infection). Her urine samples were sent you routine examination as well as culture and sensitivity. On routine examination (Urine R/E) there were 20 – 25 WBCs. Culture revealed non-hemolytic pinpoint colonies on Blood agar gram stain should Gram positive cocci (predominantly tetrads). Lancefield grouping identified them as Grp D streptococci. What is the next best step in identification of species.

a. Perform oxidase test
b. Inoculate on enterococcus set
c. Inoculate on CLED agar
d. Perform PYR test

KEY: b

531. Which of the following micro-organism does not grow on Mac-conkey agar?

a. Streptococcus agalactia
b. Streptococcus bovis
c. Enterococcus feacium
d. Streptococcus pyogenes.

KEY: d

532. A 25 yr old patient of leukemia is undergoing pre transplant workup. His throat and nasal swabs were taken for detection of MRSA. Which of the following is responsible for the development of high level of resistant in this organism.

a. Lactomase production
b. Mec-A gene
c. ESBL Production
d. MAC gene

KEY: b

The mec-A gene is responsible for methicillin resistance in *Staphylococcus aureus* (MRSA). This gene encodes a modified penicillin-binding protein (PBP2a), which has a low affinity for beta-lactam antibiotics,

including methicillin, thus making the bacteria resistant to these drugs

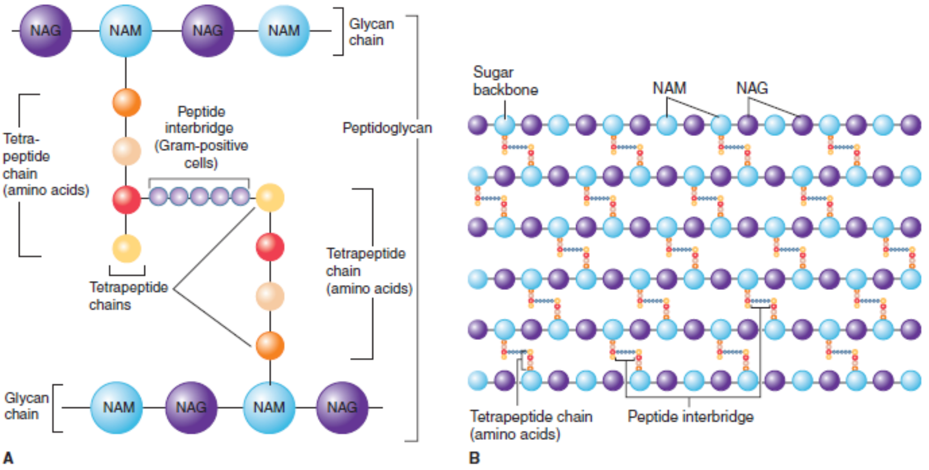
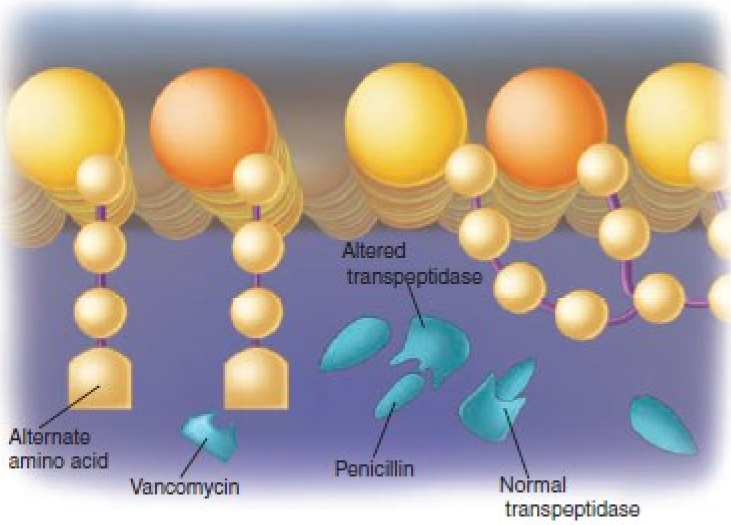

NAG
NAM
NAG
NAM
Glycan chain
Peptidoglycan
Tetra-peptide chain (amino acids)
Peptide interbridge (Gram-positive cells)
Tetrapeptide chains
Tetrapeptide chain (amino acids)
Glycan chain
NAM
NAG
NAM
NAG
A
Sugar backbone
NAM
NAG
Tetrapeptide chain (amino acids)
Peptide interbridge
B

FIGURE 2–5 Peptidoglycan structure. **A:** Peptidoglycan is composed of a glycan chain (NAM and NAG), a tetrapeptide chain, and a cross-link (peptide interbridge). **B:** In the cell wall, the peptidoglycan forms a multilayered, three-dimensional structure. NAG, *N*-acetylglucosamine; NAM, *N*-acetylmuramic acid. (Reproduced with permission from Nester EW et al. *Microbiology: A Human Perspective.* 6th ed. New York, NY: McGraw-Hill; 2009.)

FIGURE 23–9. Altered target resistance. (Compare with Figure 23–1A, B.) A normal transpeptidase or penicillin-binding protein (PBP) is inactivated by penicillin, but penicillin no longer binds to the PBP with altered binding sites. This PBP is still able to carry out its cross-linking function so the β-lactam is no longer effective. Also shown is a terminal amino acid substitution which will no longer bind vancomycin (see Figure 23–1C).


Altered transpeptidase
Alternate amino acid
Vancomycin
Penicillin
Normal transpeptidase

533. Which of the following member of enterbacteriaceae is catalase negative

a. E. coli
b. Klebsiella pneumonia
c. Seratia odorifera
d. Shigella dysentriae type II
e. Shigella dysentriea type I

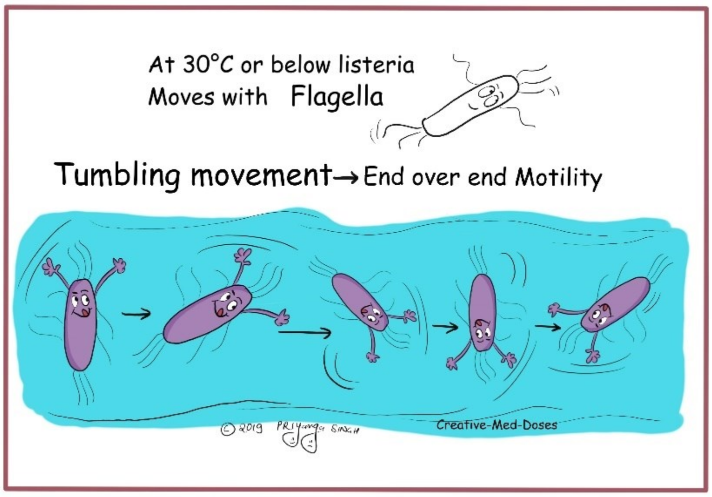
KEY: e

All Enterobacteriaceae catalase positive except shigella dysentriae type 1
All Enterobacteriaceae oxidase negative except pleisomonas shigelloides

534. A group of three female friends developed diarrhea after eating dinner from a local spot. One of them was pregnant and got septicemia leading to spontaneous abortion. On blood culture, small, aerobic, motile Gram-positive rod was isolated. The organism had characteristic tumbling motility. What is the most likely organism?

A: Corynebacterium spp
B: Listeria monocytogenes
C: Bacillus cereus
D: Leptospira
E: Staphylococcus aureus

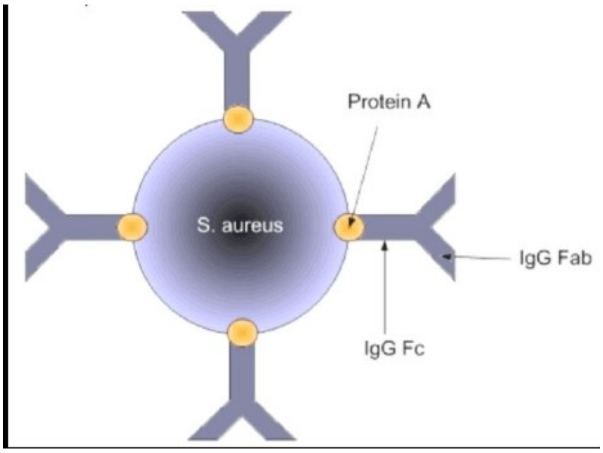
KEY: b


At 30°C or below listeria
Moves with Flagella
Tumbling movement→End over end Motility
© 2019
Creative-Med-Doses

535. A young boy sustained road traffic accident and operated for fracture left radius. Two days later wound got infected. Culture of the wound yielded growth of Staphylococcus aureus. An important virulence factor of this bug is Protein A. Which of the following is true about protein A:

A: It hydrolyses secretory IgA
B: Prevents activation of complement
C: Binds Fc region of IgG
D: Punch holes in the cells
E: Extracts iron from plasma proteins

KEY: C



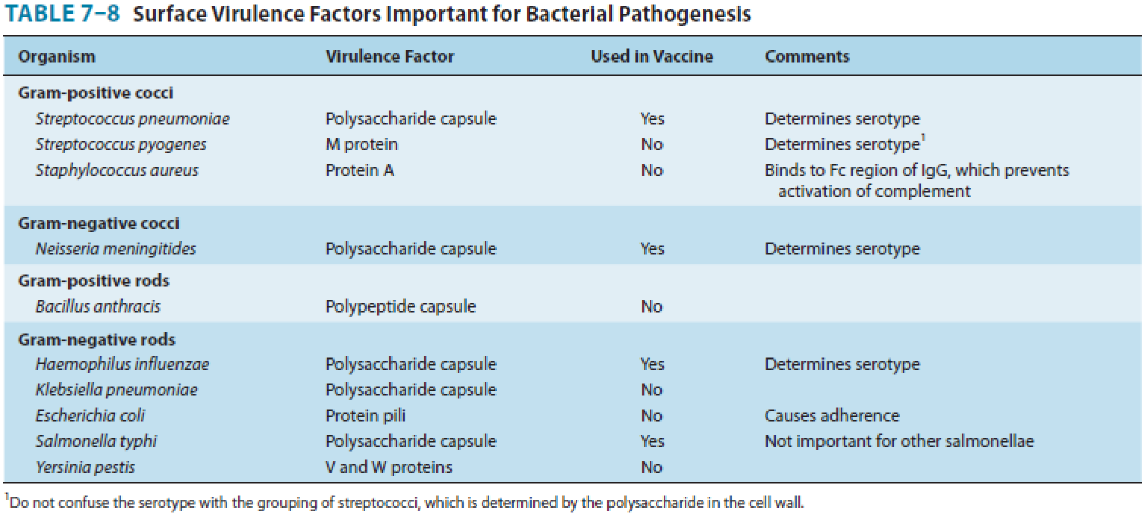
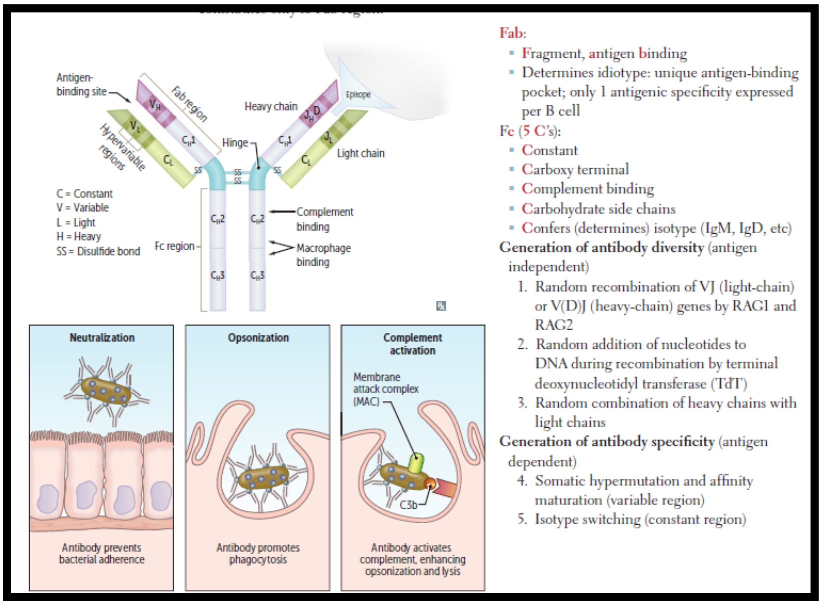


TABLE 7–8 Surface Virulence Factors Important for Bacterial Pathogenesis

Organism	Virulence Factor	Used in Vaccine	Comments
Gram-positive cocci			
Streptococcus pneumoniae	Polysaccharide capsule	Yes	Determines serotype
Streptococcus pyogenes	M protein	No	Determines serotype[1]
Staphylococcus aureus	Protein A	No	Binds to Fc region of IgG, which prevents activation of complement
Gram-negative cocci			
Neisseria meningitides	Polysaccharide capsule	Yes	Determines serotype
Gram-positive rods			
Bacillus anthracis	Polypeptide capsule	No	
Gram-negative rods			
Haemophilus influenzae	Polysaccharide capsule	Yes	Determines serotype
Klebsiella pneumoniae	Polysaccharide capsule	No	
Escherichia coli	Protein pili	No	Causes adherence
Salmonella typhi	Polysaccharide capsule	Yes	Not important for other salmonellae
Yersinia pestis	V and W proteins	No	

[1] Do not confuse the serotype with the grouping of streptococci, which is determined by the polysaccharide in the cell wall.


Antigen-binding site
Fab region
Hypervariable regions
V_H
V_L
C_H1
C_L
SS
Hinge
Heavy chain
J_H D
J_L
Epitope
Light chain
C = Constant
V = Variable
L = Light
H = Heavy
SS = Disulfide bond
Fc region
C_H2
C_H3
Complement binding
Macrophage binding
Neutralization
Antibody prevents bacterial adherence
Opsonization
Antibody promotes phagocytosis
Complement activation
Membrane attack complex (MAC)
C3b
Antibody activates complement, enhancing opsonization and lysis

Fab:

- Fragment, antigen binding
- Determines idiotype: unique antigen-binding pocket; only 1 antigenic specificity expressed per B cell

Fc (5 C's):

- Constant
- Carboxy terminal
- Complement binding
- Carbohydrate side chains
- Confers (determines) isotype (IgM, IgD, etc)

Generation of antibody diversity (antigen independent)

1. Random recombination of VJ (light-chain) or V(D)J (heavy-chain) genes by RAG1 and RAG2
2. Random addition of nucleotides to DNA during recombination by terminal deoxynucleotidyl transferase (TdT)
3. Random combination of heavy chains with light chains

Generation of antibody specificity (antigen dependent)

4. Somatic hypermutation and affinity maturation (variable region)
5. Isotype switching (constant region)

536. A 25 years old soldier with no significant past history presented with one day history of high grade fever, vomiting and neck stiffness. A lumbar puncture was performed and Gram stain of the CSF showed Gram negative diplococcic in pus cells. A presumptive diagnosis of Neisseria meningitis was made. What is the most essential virulence factor of this organism which aids in meningeal spread?

A: Peptidoglycan
B: Teichoeic acid
C: Polysaccharide capsule
D: Endotoxin
E: Exotoxin

KEY: C

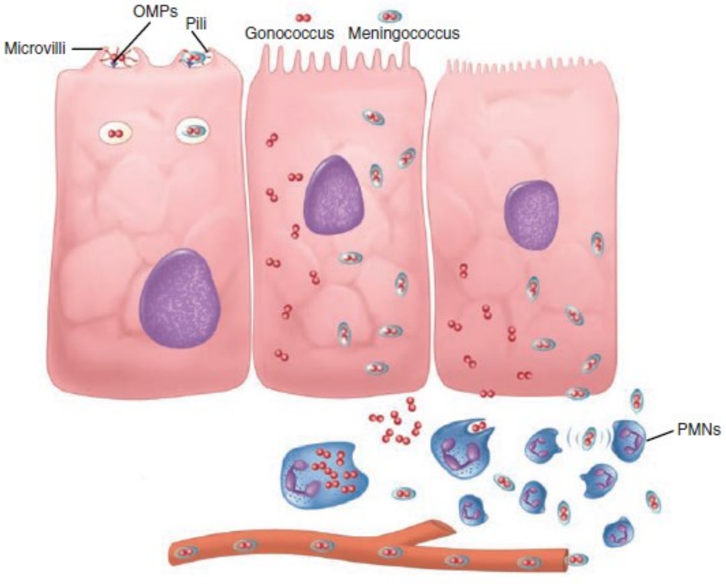

Microvilli
OMPs
Pili
Gonococcus
Meningococcus
PMNs

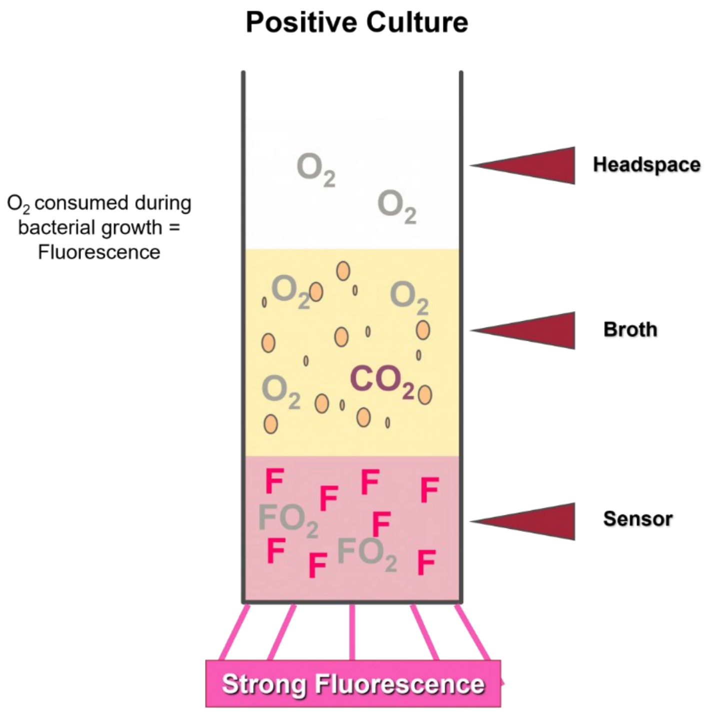
FIGURE 30–2. Gonococcus and meningococcus, cellular view. *Neisseria gonorrhoeae* and *Neisseria meningitidis* differ in that *N meningitidis* has a capsule. (*Left*) Both attach to microvillus cells by outer membrane proteins (OMP) and pili. They are endocytosed in vacuoles. (*Middle*) Both multiply freely in the cytoplasm. (*Right*) Both escape to the submucosa, but the gonococcus is actively phagocytosed and remains localized. The meningococcal capsule allows it to evade phagocytosis and it enters the bloodstream. PMNs, polymorphonuclear neutrophils.

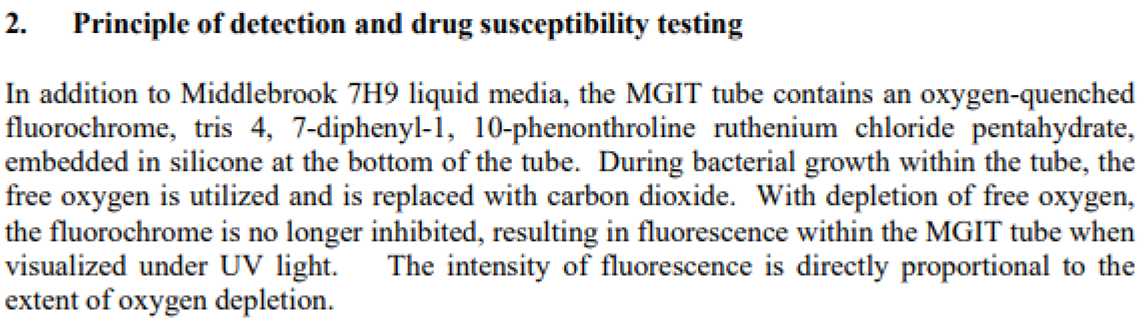
The polysaccharide capsule is crucial for the bacterium's ability to evade the host immune system. It helps in resisting phagocytosis by neutrophils and other immune cells, allowing the bacteria to persist in the bloodstream and eventually invade the meninges, leading to meningitis.

537. A 32 year old male presented with three weeks history of productive cough and weight loss. His sputum specimen was cultured on MGIT 960 TB system which gave positive growth after 10 days of incubation at 37°C. This system works on the principle of:

A: Release of CO2 from bacteria
B: Calorimetric method
C: Oxygen quenching system
D: Heat sensitive
E: Nitrate reduction

KEY: C


Positive Culture
O_2 consumed during bacterial growth = Fluorescence
Headspace
Broth
Sensor
O_2
CO_2
F
FO_2
Strong Fluorescence



2. Principle of detection and drug susceptibility testing

In addition to Middlebrook 7H9 liquid media, the MGIT tube contains an oxygen-quenched fluorochrome, tris 4, 7-diphenyl-1, 10-phenonthroline ruthenium chloride pentahydrate, embedded in silicone at the bottom of the tube. During bacterial growth within the tube, the free oxygen is utilized and is replaced with carbon dioxide. With depletion of free oxygen, the fluorochrome is no longer inhibited, resulting in fluorescence within the MGIT tube when visualized under UV light.   The intensity of fluorescence is directly proportional to the extent of oxygen depletion.

538. A 60 year old immunocompromised patient presented with five days history of fever, purulent cough and breathlessness. Sputum for AFB was negative. Culture of sputum yielded chalky white colonies on blood agar which later on confirmed as Nocardia. What is the most ideal treatment in this case?

A: Doxycycline
B: Amikacin
C: Co-trimoxazole
D: Augmentin
E: Erythromycin

KEY: C

(SNAP)

@fortheloveofmicrobiology

539. A 25 year old student presented with history of fever, headache and fine macular rash covering his body and limbs including palm and soles. He gives history of recent travel to Mountain areas. You are suspecting RockyMountain Spotted Fever. What question should you ask in history taking supporting your diagnosis?

A: Unprotected sex
B: Eating raw meat
C: Drinking contaminated water
D: Tick bites
E: Contact with birds

KEY: D

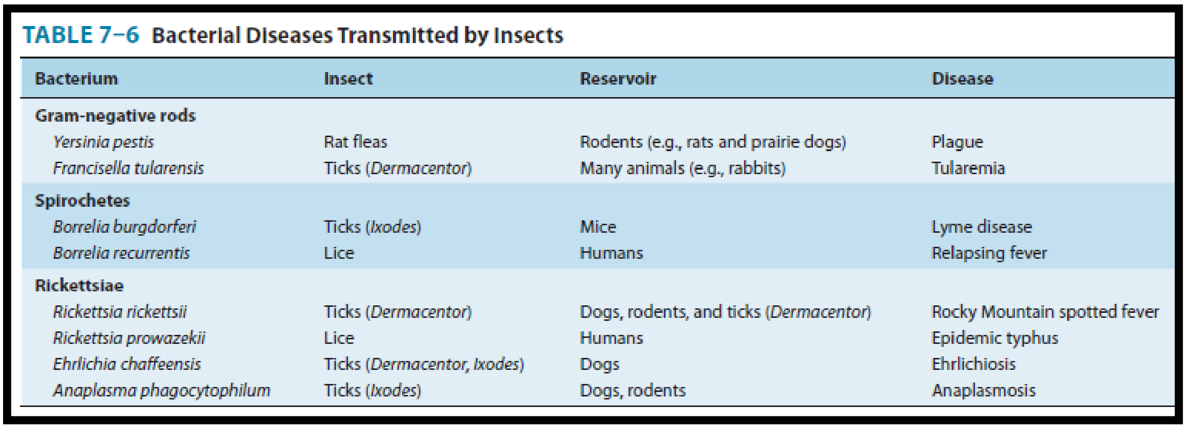


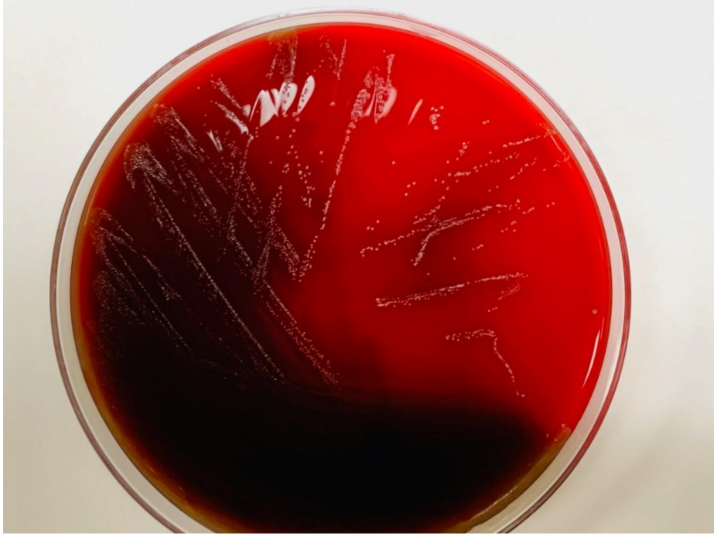
TABLE 7–6 Bacterial Diseases Transmitted by Insects

Bacterium	Insect	Reservoir	Disease
Gram-negative rods			
Yersinia pestis	Rat fleas	Rodents (e.g., rats and prairie dogs)	Plague
Francisella tularensis	Ticks (*Dermacentor*)	Many animals (e.g., rabbits)	Tularemia
Spirochetes			
Borrelia burgdorferi	Ticks (*Ixodes*)	Mice	Lyme disease
Borrelia recurrentis	Lice	Humans	Relapsing fever
Rickettsiae			
Rickettsia rickettsii	Ticks (*Dermacentor*)	Dogs, rodents, and ticks (*Dermacentor*)	Rocky Mountain spotted fever
Rickettsia prowazekii	Lice	Humans	Epidemic typhus
Ehrlichia chaffeensis	Ticks (*Dermacentor, Ixodes*)	Dogs	Ehrlichiosis
Anaplasma phagocytophilum	Ticks (*Ixodes*)	Dogs, rodents	Anaplasmosis

540. A 30 year old male with known history of congenital heart disease presented in emergency with three days history of intermittent fever and chills. Blood cultures were taken and aerobic blood culture yielded growth on blood agar and chocolate agar. The colonies slightly pitted the growth media. The isolate was catalase negative but oxidase and indole positive. What is most likely organism?

A: Haemophilus aphrophilus
B: Cardiobacterium hominis
C: Actinomyces
D: Ekinella corrodons
E: Kingella kingiae

KEY: **B (MICRO PPL)**



***Cardiobacterium hominis* is known for its role in infective endocarditis, particularly in patients with underlying heart conditions such as congenital heart disease. It is catalase-negative, oxidase-positive, indole-positive, and produces colonies that can slightly pit the agar, which fits the description provided in the question**

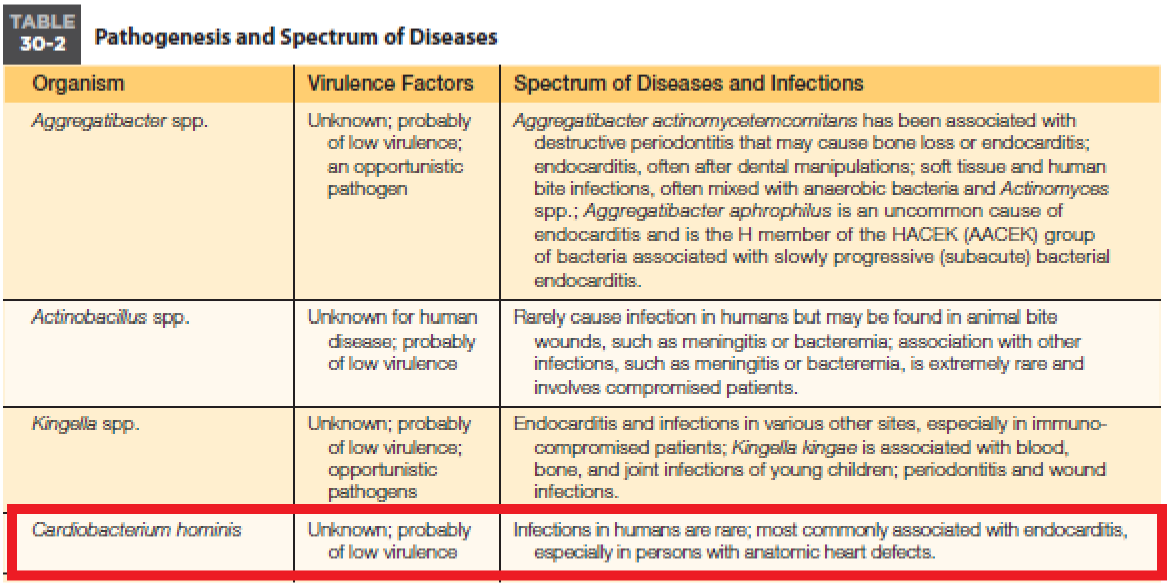


TABLE 30-2 **Pathogenesis and Spectrum of Diseases**

Organism	Virulence Factors	Spectrum of Diseases and Infections
Aggregatibacter spp.	Unknown; probably of low virulence; an opportunistic pathogen	*Aggregatibacter actinomycetemcomitans* has been associated with destructive periodontitis that may cause bone loss or endocarditis; endocarditis, often after dental manipulations; soft tissue and human bite infections, often mixed with anaerobic bacteria and *Actinomyces* spp.; *Aggregatibacter aphrophilus* is an uncommon cause of endocarditis and is the H member of the HACEK (AACEK) group of bacteria associated with slowly progressive (subacute) bacterial endocarditis.
Actinobacillus spp.	Unknown for human disease; probably of low virulence	Rarely cause infection in humans but may be found in animal bite wounds, such as meningitis or bacteremia; association with other infections, such as meningitis or bacteremia, is extremely rare and involves compromised patients.
Kingella spp.	Unknown; probably of low virulence; opportunistic pathogens	Endocarditis and infections in various other sites, especially in immunocompromised patients; *Kingella kingae* is associated with blood, bone, and joint infections of young children; periodontitis and wound infections.
Cardiobacterium hominis	Unknown; probably of low virulence	Infections in humans are rare; most commonly associated with endocarditis, especially in persons with anatomic heart defects.

541. A 15 year old boy presented with 7 days history of fever, malaise, painful red swollen right hand and lymphadenopathy of right arm and axilla. He gives history of handling with a pet cat. What pathogen is most likely suspected from the choices given below?

A: Pasteurella multocida
B: Haemophilus influenza
C: Peptostreptococcus
D: Streptobacillus moniliformis
E: Francisella tularensis

KEY: A

***Pasteurella multocida* is a common pathogen associated with cat and dog bites or scratches, and it can lead to localized infections like cellulitis, lymphadenopathy, and abscesses, especially in individuals handling pets.**

542. A 19 years old college student presented with one week history of fever, malaise and dry cough. Her chest X-ray showed diffuse lung infiltrates. She was prescribed with tablet Erythromycin because physician thinks that the causative agent is resistant to beta lactam drugs. Which organism the physician is suspecting?

A: Streptococcus pneumoniae
B: Mycobacterium tuberculosis
C: Coxiella burnetii
D: Mycoplasma pneumonia
E: Legionella pneumophilia

KEY: D

For micro ppl know that Rx of Mycoplasma pneumoniae according to Sanford === Primary regimen is Doxycycline 100mg IV PO BD 7 days and alternative is Azithromycin 500mg PO on day 1 and then 250 mg PO daily x 4 days OR Levofloaxin 750 mg PO IV x 05 days

543. A 10 year old girl developed fever and sore throat. She took Syrup Augmentin for three days. About two weeks later, she developed joint pains. On auscultation of heart, a soft murmur was found. To rule out rheumatic fever,a serological test was advised. Which antigen should be used in this test for confirmation?

A: Protein A of Staphylococcus
B: K1 antigen of E. coli
C: M protein of Streptococcus pyogenes
D: Alpha toxin of Clostridium difficile
E: Filamentous hemagglutinins of Bordetella pertusis

KEY: C

The ASO test measures the levels of antibodies against streptolysin O, a toxin produced by *Streptococcus pyogenes*.

544. A young medical student went for fishing at Khan Pur Dam. During fishing, he was accidentally pricked with the fish barb and punctured his left arm. Two days later, the boy developed fever and swelling of left arm. Gram stain of the aspirate from the swelling revealed Gram negative bacilli. The isolate grew on blood and MacConkey agar. It was indole positive and produced H2S but was oxidase and urease negative. What is the most likely diagnosis?

A: Vibrio cholerae
B: Pseudomonas aeruginosa
C: Edwardsiella tarda
D: Aeromonas hydrophilia
E: Stenotrophomonas maltophilia

KEY: C (MICRO PPL)

□ The patient developed fever and swelling of the arm following a fish barb injury, which raises the suspicion for an infection caused by a water-borne pathogen.
□ This bacterium is commonly associated with wound infections following contact with water or aquatic animals, such as fish punctures, and is a known cause of "fish handler's disease".

545. A 24 year old adult presented with 30% burns after an accidental gas cylinder explosion. About 03 days after admission; he develops infection of the burn site with discharge from the wound. Culture was taken and culture of the discharge yielded growth of green colored colonies on MacConkey agar which were oxidase positive. What is the most likely organism?

A: Proteus mirabilis
B: Pseudomonas aeruginosa
C: Eshcerichia coli
D: Serretia marscesens
E: Stenotrophomonas maltophilia

KEY: B

546. A 32 years old patient presented with two weeks history of productive cough and low grade fever. He was injected with 5 tuberculin unit on his left forearm as an aid in the diagnosis of pulmonary tuberculosis. Three days later, there was induration and erythema of about 15 mm at the injection site. His tuberculin test was reported as positive. What is the most likely mechanism of this response on the skin?

A: Lysis of epithelial cells by mycobacteria
B: Induction of primary antibody response
C: Activation of complement
D: Cytokine production by CD4 + T lymphocytes
E: Phagocytosis of mycobacteria

KEY: D

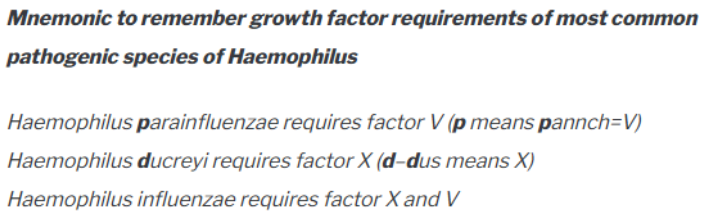
- The tuberculin skin test (TST), also known as the Mantoux test, is an example of a delayed-type hypersensitivity (DTH) reaction, which is a form of cell-mediated immune response.
- In response to the injection of purified protein derivative (PPD), the body's CD4+ T lymphocytes recognize the antigens from Mycobacterium tuberculosis if the person has been exposed to the bacteria before (either by active or latent infection).

547. A 15 year old girl is brought to the OPD in a drowsy state. According to her mother two days back, she started having complaints of severe headache, fever, photophobia and neck stiffness. Lumbar puncture is performed and CSF culture yields gram negative encapsulated rods that grow on chocolate agar enriched with factors V and X. What is the most likely diagnosis?

a) Hemophilus influenzae
b) streptococcus pneumoniae
c) Bordetella pertussis
d) Neisseria meningitides
e) Listeria monocytogenes
KEY: a

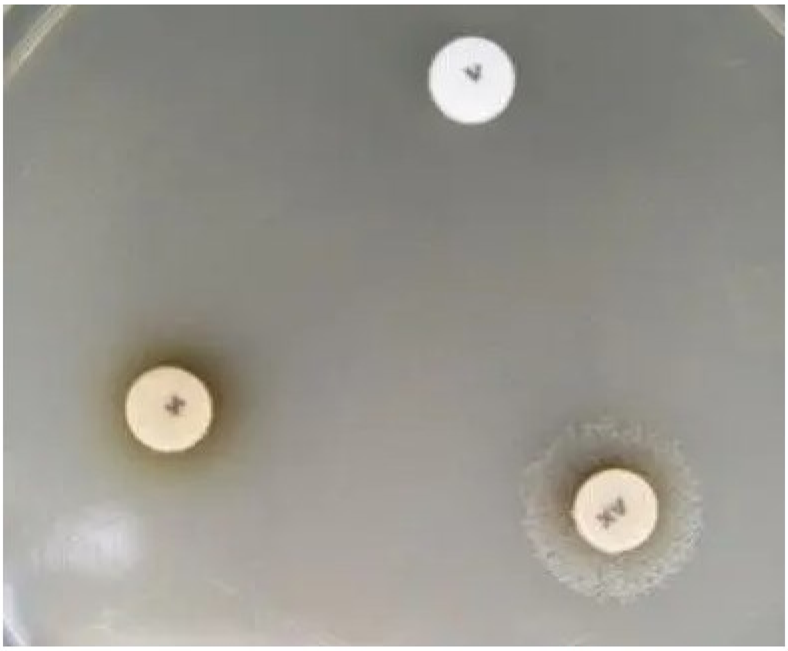
548. A 15 year old boy comes to the OPD with complaints of night sweats, evening pyrexia, dry cough, and drastic weight loss over the past several weeks. O/E he is found to have enlarged cervical lymph nodes. He also complains of expectorating very small amount of whitish sputum early in the morning after waking up. The sputum is sent for investigation. Gram stain does not reveal anything wheras Ziehl-neelsen stain reveals pink rods on a blue background . What is the most likely organism involved?

a) chlamydia pneumophila
b) Mycobacterium tuberculosis
c) hemophilus influenzae
d) mycoplasma pneumoniae
e) legionella pneumoniae
KEY: b



Mnemonic to remember growth factor requirements of most common pathogenic species of Haemophilus

Haemophilus ***p****arainfluenzae requires factor V (****p*** *means* ***p****annch=V)*
Haemophilus ***d****ucreyi requires factor X (****d****–****d****us means X)*
Haemophilus influenzae requires factor X and V

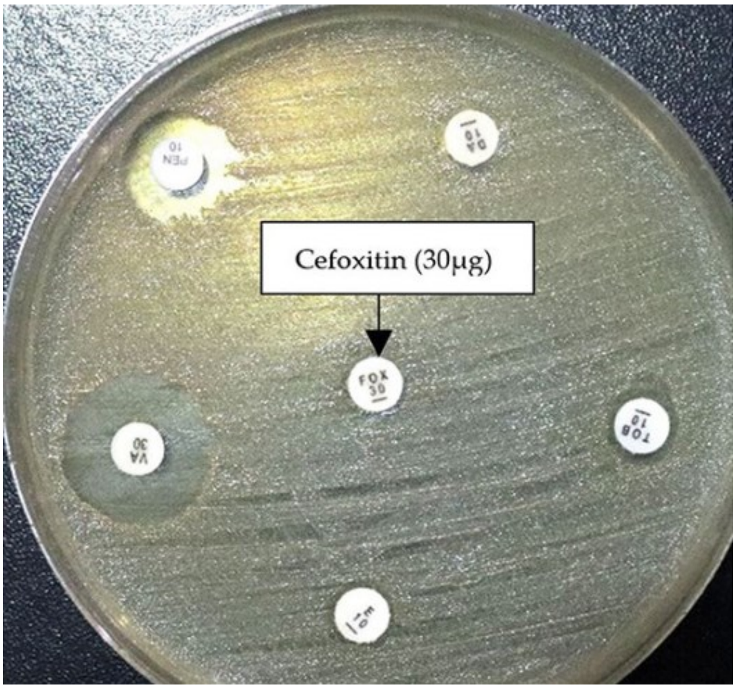


This strain is presumptively *Haemophilus influenzae* as it has grown only around the disk containing both XV factor.

549. A 27 year old woman underwent appendectomy. She was discharged after three days. She presented few days later with localized pain at wound site and fever. She was found to have an infection. Pus culture yielded growth of colonies whose Gram stain revealed gram positive cocci in clusters. The isolate is declared to be MRSA . Resistance to which diagnostic drug disc helped the microbiologist reach this decision?

a) cefoxitin
b) oxacillin
c) novobiocin
d) optochin
e) bacitracin

KEY: a



550. A 28 year old housewife suffered from severe third degree burns while working in the kitchen. She was admitted to the Burns unit of a tertiary care centre. A few days later she developed greenish coloured pus in her superficial wounds. The pus was sent for culture and mucoid colonies were grown on blood agar. As a microbiologist what is the next test you would like to perform to help aid the diagnosis?

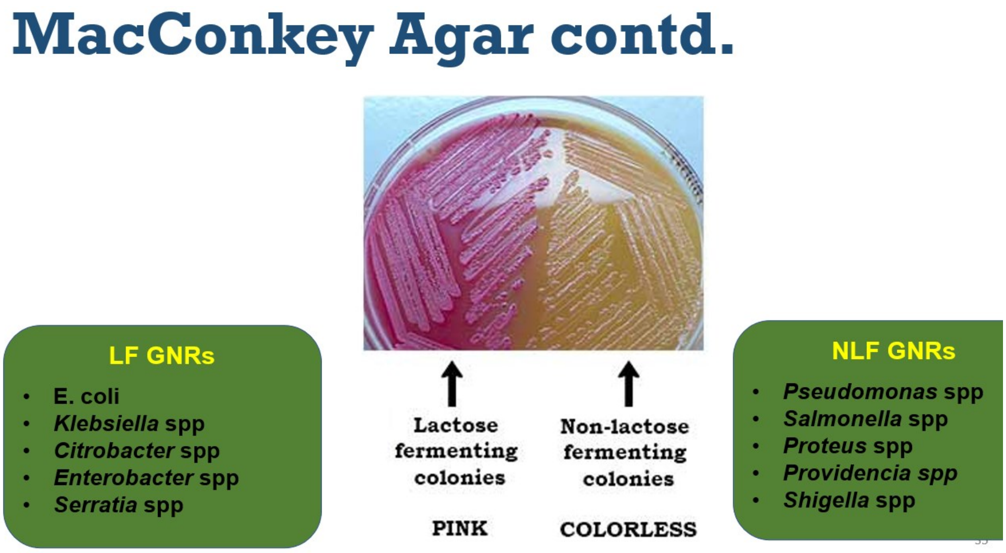
a) Catalase
b) Coagulase
c) Urease
d) Oxidase
e) Indole

KEY: d

551. A 27 year old lady presented with complaints of burning micturition, lower abdominal pain, polyuria, dysuria and post micturition dribbling for the past 6 days. Her urine culture revealed lactose fermenter colonies on MacConkey agar. As a microbiologist what next step would you like to perform to aid your diagnosis?

a) Novobiocin drug disc testing
b) Urease
c) Indole
d) Citrate production
e) oxidase

KEY: c



MacConkey Agar contd.

LF GNRs

- E. coli
- *Klebsiella* spp
- *Citrobacter* spp
- *Enterobacter* spp
- *Serratia* spp

Lactose fermenting colonies

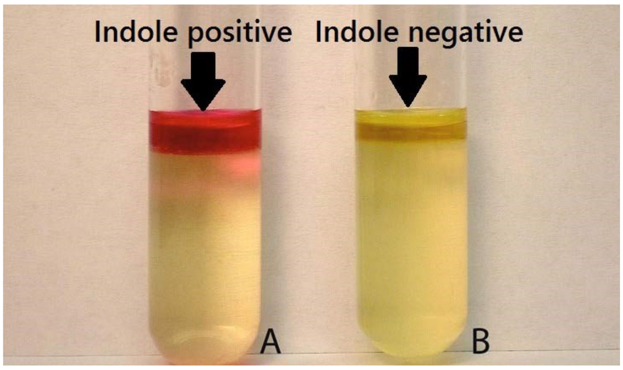
PINK

Non-lactose fermenting colonies

COLORLESS

NLF GNRs

- *Pseudomonas* spp
- *Salmonella* spp
- *Proteus* spp
- *Providencia spp*
- *Shigella* spp



552. A 10 year old boy suffered a cut on the elbow when he fell on the ground while cycling in his compound. First aid was applied. The boy developed localized pain and was found to have yellowish pus in the wound. The pus was sent for culture. The gram stain revealed gram positive cocci in clusters . What test would you like to perform to confirm your diagnosis?

a) Lance field grouping
b) Bile solubility
c) Cefoxitin drug disc testing
d) DNAse
e) Catalase & Coagulase

KEY: e

553. A 7 year old boy presents with fever, shortness of breath and malaise. He appears to be toxic. O/E he is revealed to have a greyish white membrane in his throat covering his nasopharynx. A provisional diagnosis of Diphtheria is made on clinical grounds. Regarding the toxin involved the genetic transfer from one organism to another is made via the assistance of a bacteriophage. What is this process called?

a) Transfection
b) Transduction
c) Transportation
d) Transformation
e) Transposition

KEY: b

554. A 8 year old boy got wounded while playing on the road when a rusted nail injured his foot. His parents rushed him to the emergency. His wound was cleaned and he was given a shot of Tetanus immunoglobulins. This is an example of

a) Herd immunity
b) Active immunity
c) Passive immunity
d) Active on passive immunity
e) Humoral immunity

KEY: c

555. A medical researcher was doing research on strains of Escherichia coli. He wanted to study the virulence genes of the organism. In his laboratory, he planned to transfer genes from virulent strains of Escherichia coli into avirulent strains. Which process of bacterial genetics will best help him carry out his research effectively?

a) Transfection
b) Conjugation
c) Transduction
d) Transportation
e) Lysogeny

KEY: a

556. A 21-year-old woman was brought to the OPD in comatose state. She was having flaccid paralysis. Her family members said that she had gone on a diet lately and was in the habit of making salads using fresh produce as well as some canned vegetables like mushrooms and peas. Which virulence factor of the most likely causative organism is involved?

a) shiga toxin
b) botulinum toxin
c) staphylococcal enterotoxin
d) clostridium perfringens enterotoxin
e) verotoxin of enterohaemorrhagic Escherichia Coli

KEY b

557. A 15 year boy developed nausea and vomiting 7 hours after having a meal of fried rice at a family dinner at a local Chinese restaurant. What is the most probable virulence factor involved?

a) Staphylococcus enterotoxin
b) Vibrio cholerae exotoxin
c) Enterotoxin of Escherichia coli
d) Preformed toxin of bacillus cereus
e) Salmonella enterotoxin

KEY d

558. A 25 year old boy suffering from typhoid fevers had been treated with cephalosporins and macrolides for the past two weeks. He had a relapse and had to undergo an extended course of antibiotics. During his third week of treatment he developed watery diarrhea . Which member of the normal flora is responsible for development of his symptoms?

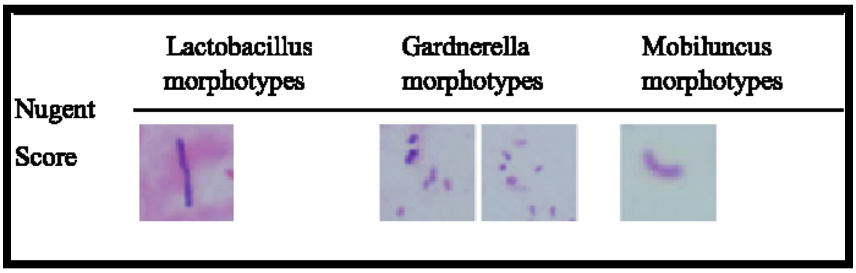
a) Escherichia coli
b) Bacteroides fragilis
c) Enterobacter cloacae
d) Clostridium difficile
e) Salmonella enteritidis
KEY d

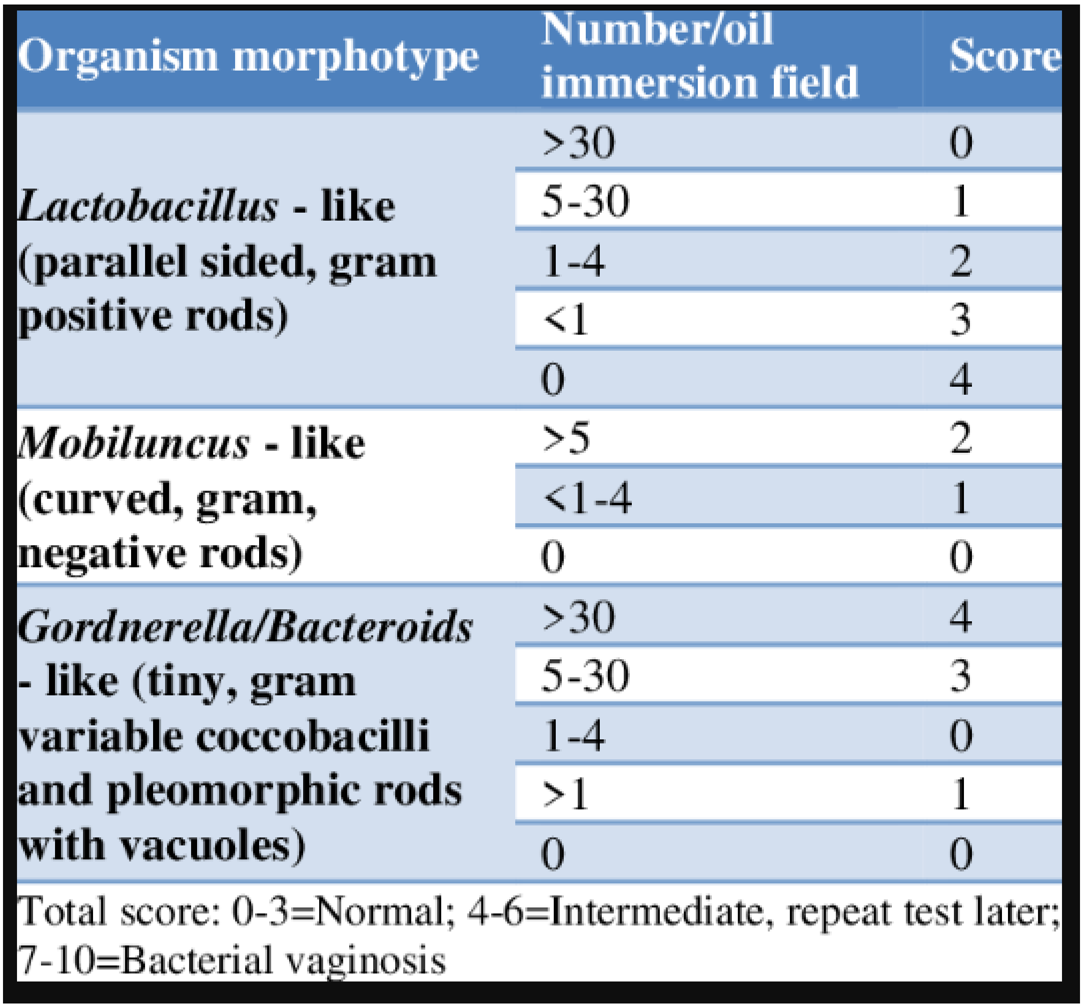
559. A two-year-old boy is rushed to the emergency in a state of severe dehydration by his parents. He is having severe watery diarrhea. The clinician observes that he is passing ‘rice water stools’. What media would you like to culture the stool on to diagnose the most likely pathogen involved?

a) DCA
b) XLD
c) TT broth
d) SMA
e) TCBS
KEY e

560. A 26 year old lady was having vaginal discharge for the past one week. She was married but not having any issue. An HVS sample was taken . Which test can be performed on gram staining to determine presence of infection in this patient?

a) Modified kinyoun stain
b) Alberts stain
c) Lactophenol cotton blue stain
d) Nugent’s scoring
e) India ink stain
KEY d





Organism morphotype	Number/oil immersion field	Score
Lactobacillus - like (parallel sided, gram positive rods)	>30	0
	5-30	1
	1-4	2
	<1	3
	0	4
Mobiluncus - like (curved, gram, negative rods)	>5	2
	<1-4	1
	0	0
Gordnerella/Bacteroids - like (tiny, gram variable coccobacilli and pleomorphic rods with vacuoles)	>30	4
	5-30	3
	1-4	0
	>1	1
	0	0
Total score: 0-3=Normal; 4-6=Intermediate, repeat test later; 7-10=Bacterial vaginosis		

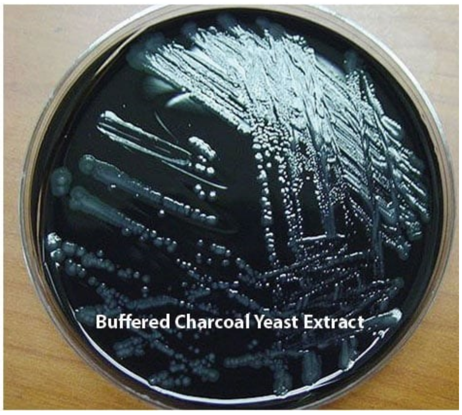
561. An 18 year old male university student comes to the OPD with complaints of 9 days history of high grade fever, abdominal pain and vomiting. The fever is low grade in the morning but starts gradually increasing in the evening and reaches a spike of 102-103 F in the night but never touches baseline. How can a confirmatory diagnosis be made in such a case?

a) blood culture
b) typhidot IgM
c) stool culture
d) Widal test
e) urine culture
KEY a

562. A 15 year old boy had complaints of dry cough, malaise, intermittent fever and dyspnea. A chest X ray revealed patchy diffuse pulmonary infiltrates. A sputum culture yielded growth on buffered charcoal yeast extract agar (BCYE). Whatis the most likely pathogen grown?

a) Bordetella pertussis
b) Hemophilus influenza
c) Legionella pneumophila
d) Mycoplasma pneumonia
e) Streptococcus pneumonia
KEY c

M813
Legionella pneumophila
33153



563. A 15 year old boy presented to the emergency in a drowsy state. According to his father he started having sudden onset of headache five days back which was later accompanied by photophobia and gradually worsening loss of consciousness. He was also complaining of neck stiffness. CSF culture yielded growth of dome shaped colonies on chocolate agar placed in CO2 incubator. What is the most likely pathogen yielded?

a) Neisseria meningitides
b) Listeria monocytogenes
c) Hemophilus influenza
d) Streptococcus pneumoniae
e) Legionella pneumophila

KEY a

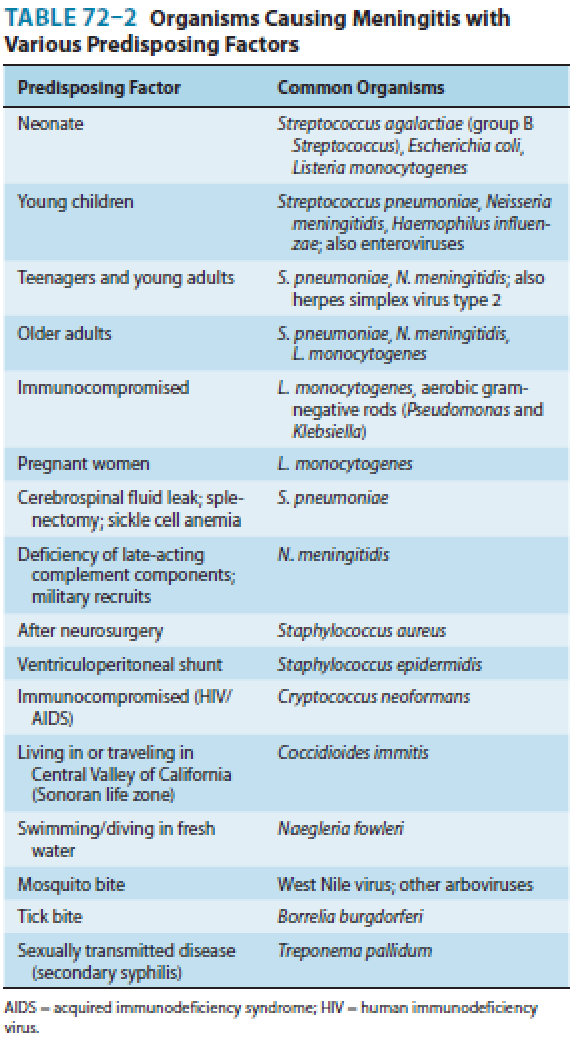


TABLE 72–2 Organisms Causing Meningitis with Various Predisposing Factors

Predisposing Factor	Common Organisms
Neonate	*Streptococcus agalactiae* (group B *Streptococcus*), *Escherichia coli*, *Listeria monocytogenes*
Young children	*Streptococcus pneumoniae*, *Neisseria meningitidis*, *Haemophilus influenzae*; also enteroviruses
Teenagers and young adults	*S. pneumoniae*, *N. meningitidis*; also herpes simplex virus type 2
Older adults	*S. pneumoniae*, *N. meningitidis*, *L. monocytogenes*
Immunocompromised	*L. monocytogenes*, aerobic gram-negative rods (*Pseudomonas* and *Klebsiella*)
Pregnant women	*L. monocytogenes*
Cerebrospinal fluid leak; splenectomy; sickle cell anemia	*S. pneumoniae*
Deficiency of late-acting complement components; military recruits	*N. meningitidis*
After neurosurgery	*Staphylococcus aureus*
Ventriculoperitoneal shunt	*Staphylococcus epidermidis*
Immunocompromised (HIV/AIDS)	*Cryptococcus neoformans*
Living in or traveling in Central Valley of California (Sonoran life zone)	*Coccidioides immitis*
Swimming/diving in fresh water	*Naegleria fowleri*
Mosquito bite	West Nile virus; other arboviruses
Tick bite	*Borrelia burgdorferi*
Sexually transmitted disease (secondary syphilis)	*Treponema pallidum*

AIDS = acquired immunodeficiency syndrome; HIV = human immunodeficiency virus.

564. A patient underwent exploratory laparotomy following a Road traffic Accident revealing a splenic rupture. He was in a critical state and shifted to the ICU. He developed fever two days later. His CRP was raised. He was found to have infection . Pus was sent for culture. It did not yield any growth on blood and mac conkey agar after three repeated samples. What should be done in this case?

a) Apply growth on LJ media
b) Apply growth on chocolate agar in CO2 incubator
c) Apply growth in BHI
d) Apply growth at 28*C
e) Apply growth on Anaerobic Agar(Incubate pus anaerobically)

KEY e

565. A 3 months old baby girl was presented to the OPD by the mother in a drowsy state. The baby had neck stiffness , photophobia, was very irritable and cried constantly. She is taking breast feed as well as formula feed .A CSF specimen gram stain revealed gram positive rods. Culture yielded growth of beta hemolytic colonies having a narrow zone of hemolysis on blood agar . What other step would you like to perform to confirm the growth of probable pathogen?

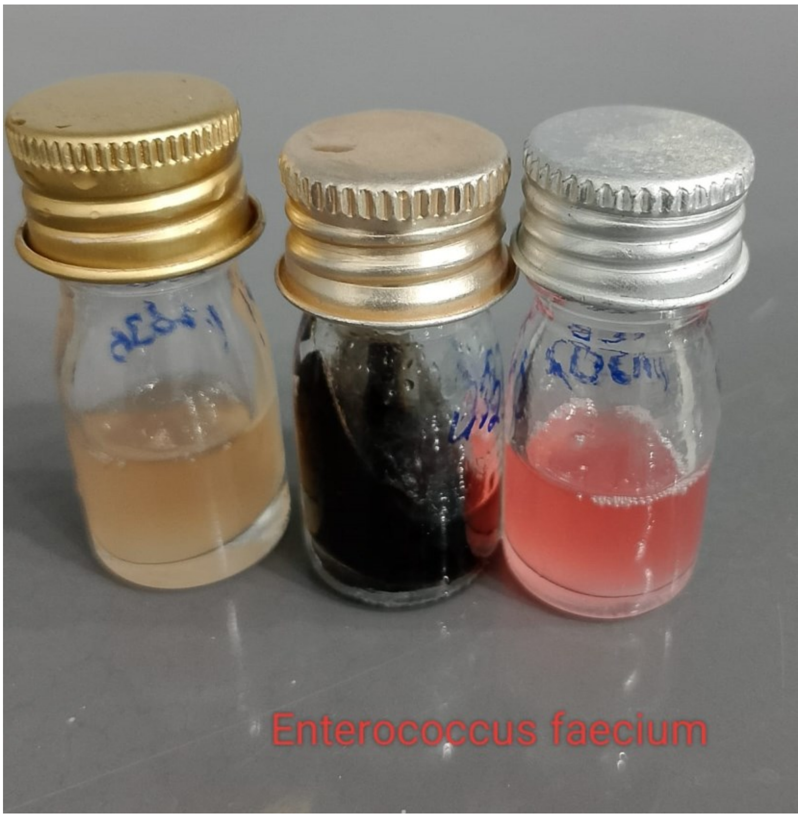
a) Incubate culture plate at - 4°C
b) Apply specimen on blood tellurite agar plate
c) Apply XV discs on culture plate
d) Apply specimen on chocolate agar and place in CO2 incubator
e) Incubate culture plate at 44°C

KEY CORRECTED = A

566. A 45 year old man has complaints of high grade fever , malaise, myalgias , arthralgias, chest pain and shortness of breath for the past 5 days . O/E he was found to have systolic murmur. A clinical suspicion of infective endocarditis was made. Blood culture yielded growth of colonies which were gram positive cocci on gram stain. The organism yielded was confirmed to be Enterococcus faecium. Positive reaction of which of the following tests helped the microbiologist reach this decision?

a) Bile Esculin agar
b) 6.5% nacl broth
c) Hippurate
d) CAMP test
e) 1% arabinose broth

KEY e

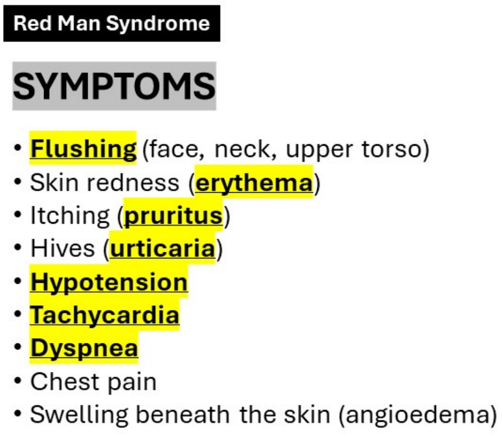


567. A 20 year old boy was admitted in the ICU after a road traffic accident in which he suffered multiple injuries. After two weeks of his stay he developed infection in his wounds on his arm. A culture revealed it to be MRSA. The patient was started on some antibiotic therapy. Two days into the treatment, he developed generalized flushing and erythemia over the body. What is the most likely antibiotic responsible for his condition?

a) Vancomycin*
b) Ampicillin
c) Linezolid
d) Tigecycline
e) Amikacin

KEY a

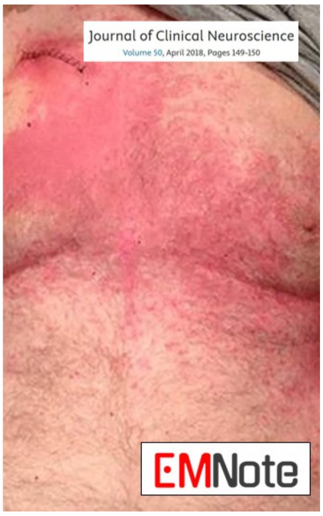
Red Man Syndrome occurs due to the rapid infusion of Vancomycin, which triggers non-IgE-mediated histamine release from mast cells and basophils. This leads to widespread flushing, erythema, and sometimes itching. Slower infusion rates can minimize the reaction.



Red Man Syndrome

SYMPTOMS

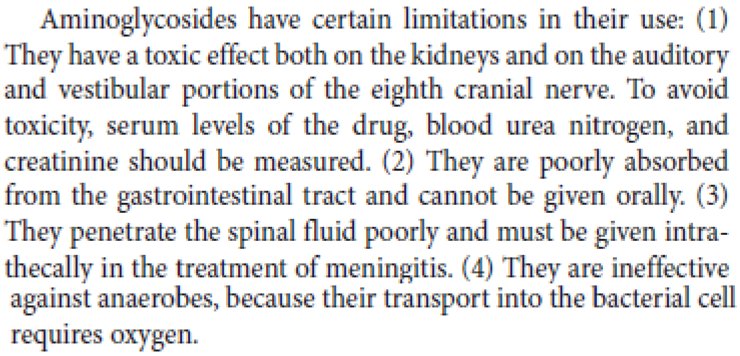
- **Flushing** (face, neck, upper torso)
- Skin redness (**erythema**)
- Itching (**pruritus**)
- Hives (**urticaria**)
- **Hypotension**
- **Tachycardia**
- **Dyspnea**
- Chest pain
- Swelling beneath the skin (angioedema)


Journal of Clinical Neuroscience
Volume 50, April 2018, Pages 149-150
EMNote

568. A 24 year old woman was admitted in the burn unit after suffering third degree burns as a result of domestic violence. She developed infection in her superficial wounds. The pus had a greenish tinge. She was put on antibiotic therapy. She responded well to the treatment. 10 days into the therapy she started complaining of tinnitus, reduced hearing and dizziness and was unable to maintain her balance while walking. What is the antibiotic most likely responsible for her condition?

a) Linezolid
b) Polymixin B
c) Cefepime
d) Meropenem
e) Amikacin

KEY e



Aminoglycosides have certain limitations in their use: (1) They have a toxic effect both on the kidneys and on the auditory and vestibular portions of the eighth cranial nerve. To avoid toxicity, serum levels of the drug, blood urea nitrogen, and creatinine should be measured. (2) They are poorly absorbed from the gastrointestinal tract and cannot be given orally. (3) They penetrate the spinal fluid poorly and must be given intrathecally in the treatment of meningitis. (4) They are ineffective against anaerobes, because their transport into the bacterial cell requires oxygen.

AMINOGLYCOSIDES ARE OTOTOXIC AND NEPHROTOXIC

569. A 7 year old child was presented to the OPD by his mother with cough, shortness of breath , low grade fever and lethargy. Despite the moderate severity of his symptoms, his CXR revealed diffuse bilateral infiltrates. After relevant investigations the child was diagnosed with atypical pneumonia by mycoplasma pneumonia and started on treatment. The child responded but a week into the treatment the mother observed brown mottling of his teeth. Which antibiotic is most likely responsible for his symptoms?

a) Amikacin
b) Tetracycline
c) Gentamicin
d) Clindamycin
e) Rifampin

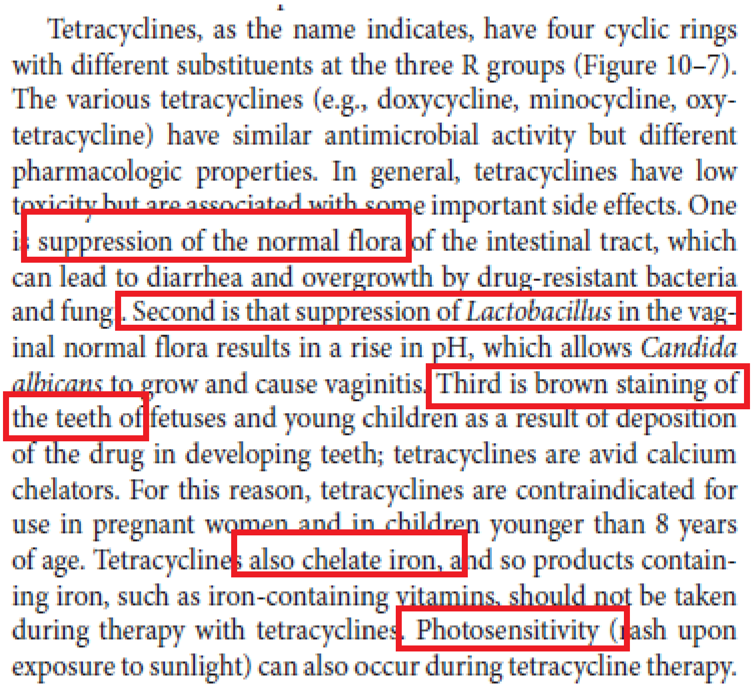
KEY b

The brown mottling of teeth is characteristic of tetracycline use, particularly in children. Tetracyclines are known to bind calcium in developing teeth, leading to permanent discoloration if used in children under 8 years of age.

570. A 42-year-old man admitted in the emergency was having high grade fever, myalgias , shortness of breath , chest pain and murmurs on auscultation. Blood culture yielded the growth of Enterococus faecium. Preliminary therapy showed noncompliance with Vancomycin. Which antibiotic would you like to prescribe in this case to combat the situation?

a. Tigecycline
b. meropenem
c. linezolid
d. cloxacillin
e. clindamycin

KEY c



Tetracyclines, as the name indicates, have four cyclic rings with different substituents at the three R groups (Figure 10–7). The various tetracyclines (e.g., doxycycline, minocycline, oxytetracycline) have similar antimicrobial activity but different pharmacologic properties. In general, tetracyclines have low toxicity but are associated with some important side effects. One is suppression of the normal flora of the intestinal tract, which can lead to diarrhea and overgrowth by drug-resistant bacteria and fungi. Second is that suppression of *Lactobacillus* in the vaginal normal flora results in a rise in pH, which allows *Candida albicans* to grow and cause vaginitis. Third is brown staining of the teeth of fetuses and young children as a result of deposition of the drug in developing teeth; tetracyclines are avid calcium chelators. For this reason, tetracyclines are contraindicated for use in pregnant women and in children younger than 8 years of age. Tetracyclines also chelate iron, and so products containing iron, such as iron-containing vitamins, should not be taken during therapy with tetracyclines. Photosensitivity (rash upon exposure to sunlight) can also occur during tetracycline therapy.

571. A 42 year old soldier who got injured in a mine blast was admitted in the ICU over a period of several days he developed severe sepsis and had multiple swellings under the skin. The swellings produced rustling sound on palpation. A clinical diagnosis of Gas gangrene caused by clostridium perfringens was made. What antibiotic would you like to prescribe in this case?

a) Clindamycin
b) Streptomycin
c) Tetracyclin
d) Doxycycline

e) Azithromycin
KEY a

Clindamycin, often combined with penicillin, is the treatment of choice for gas gangrene to combat both infection and toxin production.

572. A 42 year old woman presented with complaints of episodic epigastric pain and heart burn for the past one month. The pain was initiated 10-15 minutes after she took a meal. A gastric biopsy revealed short curved rods and stool serology revealed H.pylori stool antigen. She was put on long term treatment. Which one of the following antibiotics would you prescribe for her as a part of triple regimen therapy in her case?

a) Meropenem
b) Clindamycin
c) Vancomycin
d) Clarithromycin
e) Amikacin
KEY d

According to sanford:

P-BMT = PPI, bismuth subsalicylate, metronidazole, tetracycline
P-AMC = PPI, Amoxicllin, Metronidazole, Clarithromycin

573. A lab technician was preparing blood agar media in the lab. He took the agar base suspension and placed it in a device where he heated it at 121* C for 15 mins at 15 lb/in2 . What is the most likely procedure?

a) Incineration
b) Boiling
c) Autoclaving
d) Pasteurization
e) Fumigation
KEY c

574. A milk plant owner is concerned about possible infection in his flock. In order to ensure his milk is rendered free of pathogens he has it heated at 62*C in a device for 30 mins followed by rapid cooling in a vat. What is the most likely process involved?

a) Autoclaving
b) Pasteurization
c) Tyndallization
d) Advanced boiling
e) Coagulation
KEY b

575. A 16 year old girl having fever, abdominal pain , episodes of vomiting and myalgias was brought to the lab for her routine tests. A blood culture was advised. Which chemical disinfectant would you advise the phlebotomist to use before drawing the blood culture sample?

a) Tincture of iodine
b) ethanol
c) hexacholorophene
d) benzalkonium chloride
e) phenol
KEY a

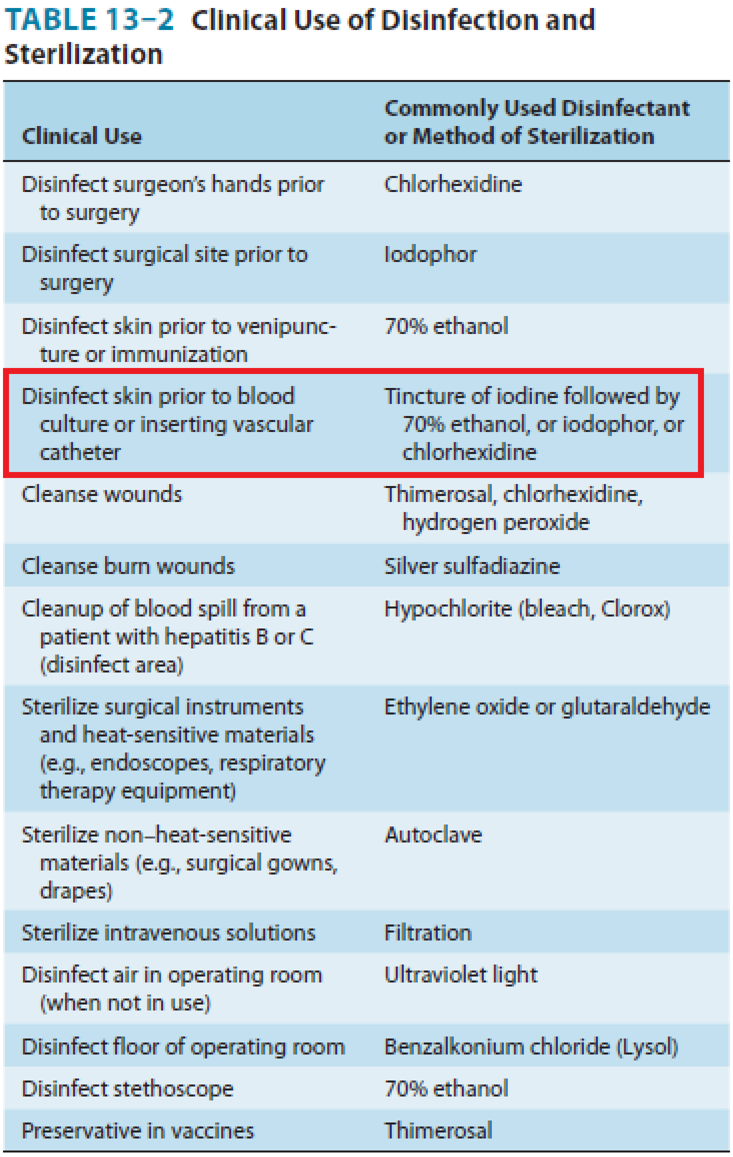


TABLE 13–2 Clinical Use of Disinfection and Sterilization

Clinical Use	Commonly Used Disinfectant or Method of Sterilization
Disinfect surgeon's hands prior to surgery	Chlorhexidine
Disinfect surgical site prior to surgery	Iodophor
Disinfect skin prior to venipuncture or immunization	70% ethanol
Disinfect skin prior to blood culture or inserting vascular catheter	Tincture of iodine followed by 70% ethanol, or iodophor, or chlorhexidine
Cleanse wounds	Thimerosal, chlorhexidine, hydrogen peroxide
Cleanse burn wounds	Silver sulfadiazine
Cleanup of blood spill from a patient with hepatitis B or C (disinfect area)	Hypochlorite (bleach, Clorox)
Sterilize surgical instruments and heat-sensitive materials (e.g., endoscopes, respiratory therapy equipment)	Ethylene oxide or glutaraldehyde
Sterilize non–heat-sensitive materials (e.g., surgical gowns, drapes)	Autoclave
Sterilize intravenous solutions	Filtration
Disinfect air in operating room (when not in use)	Ultraviolet light
Disinfect floor of operating room	Benzalkonium chloride (Lysol)
Disinfect stethoscope	70% ethanol
Preservative in vaccines	Thimerosal

576. A 29 year old microbiologist was working in the lab when she accidentally dropped one of the vials she was carrying and it broke on the floor. It contained a very pathogenic isolate. After following the SOP she brought the Spill kit to the dirty area . Which agent would you advise her to use to get maximum disinfection?

a) ethanol
b) hexa chlorophene
c) phenol
d) iodophour
e) hypochlorite

KEY e

For decontaminating a spill involving a pathogenic isolate, sodium hypochlorite (bleach) is the most effective disinfectant. It is a strong oxidizing agent that can kill a wide range of pathogens, including bacteria, viruses, and fungi, and is recommended for use in laboratory spill cleanups.

Contents of a Spill Kit:

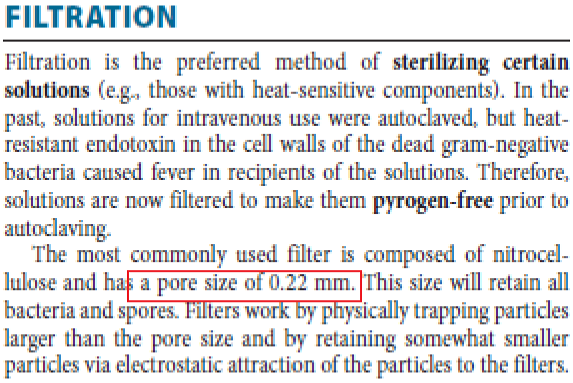
- **Personal Protective Equipment (PPE): Gloves, lab coat, goggles, mask/respirator**
- **Absorbent Materials: Pads, pillows, granules, sand**
- **Disinfectants: Sodium hypochlorite (bleach)**
- **Cleaning Tools: Towels, dustpan, brush, scoops, broom**
- **Waste Disposal: Biohazard bags, sharps containers**
- **Instructions/SOPs: Spill response protocols**

BIOHAZARD
absorbent
granules

577. A pharmaceutical company owner wants to ensure that his commercial batch of cyrstalloid I/V infusions are rendered free of pathogens. What procedure would you recommend to ensure this ?

- a) autoclaving
- b) filtration
- c) ethylene oxide chamber
- d) hot air oven
- e) pasteurization

KEY b (Filtration > Radiation)



FILTRATION

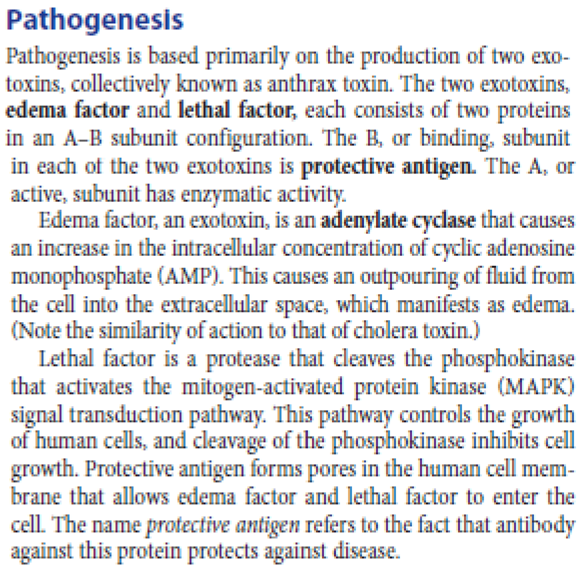
Filtration is the preferred method of **sterilizing certain solutions** (e.g., those with heat-sensitive components). In the past, solutions for intravenous use were autoclaved, but heat-resistant endotoxin in the cell walls of the dead gram-negative bacteria caused fever in recipients of the solutions. Therefore, solutions are now filtered to make them **pyrogen-free** prior to autoclaving.

The most commonly used filter is composed of nitrocellulose and has a pore size of 0.22 mm. This size will retain all bacteria and spores. Filters work by physically trapping particles larger than the pore size and by retaining somewhat smaller particles via electrostatic attraction of the particles to the filters.

578. The functionality of lethal factor requires the presence of what other protein from Bacillus anthracis to form an active toxin?

- a) Edema factor
- b) D-glutamic acid
- c) c-AMP
- d) Protective antigen
- e) Endotoxin

KEY d

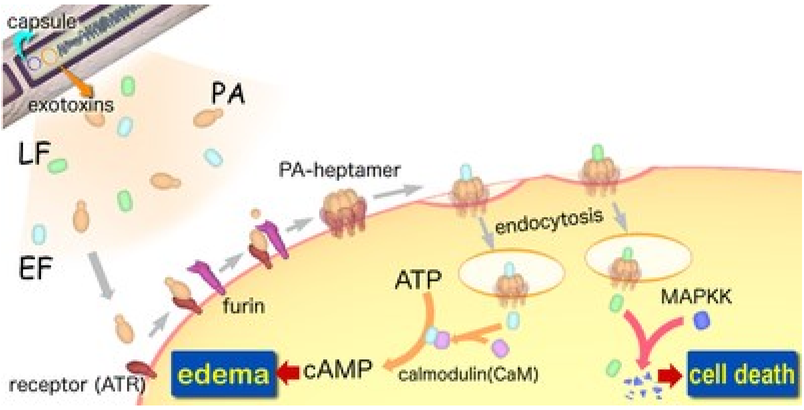


Pathogenesis

Pathogenesis is based primarily on the production of two exotoxins, collectively known as anthrax toxin. The two exotoxins, **edema factor** and **lethal factor,** each consists of two proteins in an A–B subunit configuration. The B, or binding, subunit in each of the two exotoxins is **protective antigen.** The A, or active, subunit has enzymatic activity.

Edema factor, an exotoxin, is an **adenylate cyclase** that causes an increase in the intracellular concentration of cyclic adenosine monophosphate (AMP). This causes an outpouring of fluid from the cell into the extracellular space, which manifests as edema. (Note the similarity of action to that of cholera toxin.)

Lethal factor is a protease that cleaves the phosphokinase that activates the mitogen-activated protein kinase (MAPK) signal transduction pathway. This pathway controls the growth of human cells, and cleavage of the phosphokinase inhibits cell growth. Protective antigen forms pores in the human cell membrane that allows edema factor and lethal factor to enter the cell. The name *protective antigen* refers to the fact that antibody against this protein protects against disease.



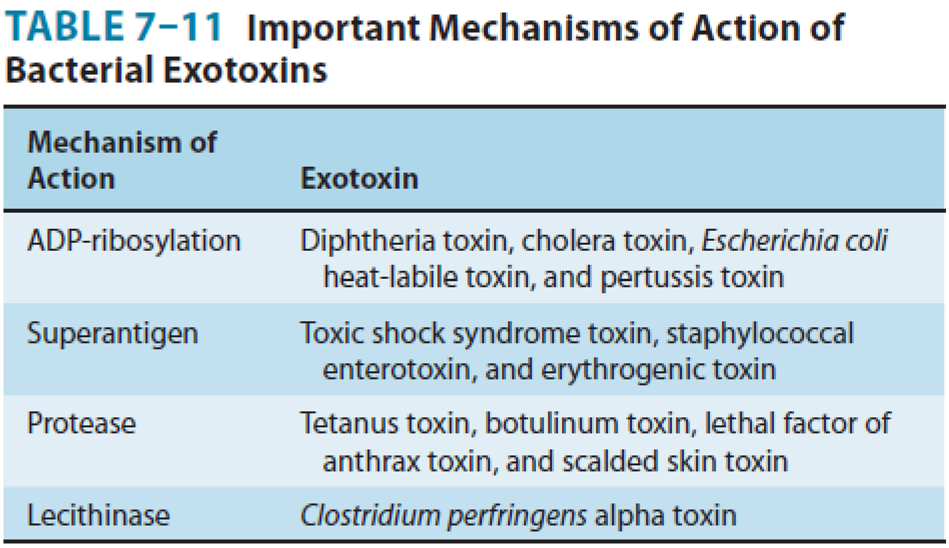


TABLE 7–11 Important Mechanisms of Action of Bacterial Exotoxins

Mechanism of Action	Exotoxin
ADP-ribosylation	Diphtheria toxin, cholera toxin, *Escherichia coli* heat-labile toxin, and pertussis toxin
Superantigen	Toxic shock syndrome toxin, staphylococcal enterotoxin, and erythrogenic toxin
Protease	Tetanus toxin, botulinum toxin, lethal factor of anthrax toxin, and scalded skin toxin
Lecithinase	*Clostridium perfringens* alpha toxin

579. Identify the test that can be used for definitive identification of BOTH N. gonorrhoeae and N. meningitidis.

a) Gram stain
b) Catalase
c) Oxidase
d) Carbohydrate utilization
e) DNase test

KEY d

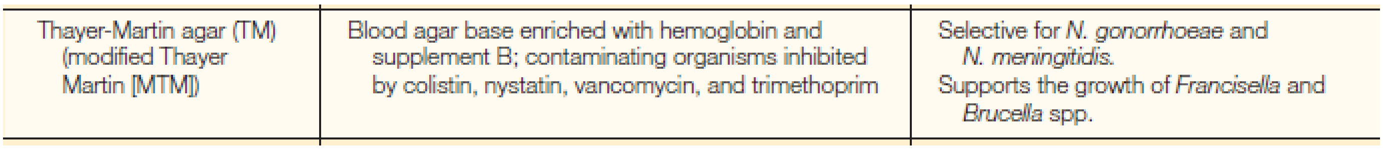
N meningitis ONLY MALTOSE….gonorrhea and meninge both ferment glucose

580. Identify a selective medium that allows the isolation of N. gonorrhoeae and N. meningitidis.

a) SBA

b) Chocolate agar
c) Modified Thayer-Martin
d) Castenada medium
e) BCYE Agar

KEY c



Thayer-Martin agar (TM) (modified Thayer Martin [MTM])	Blood agar base enriched with hemoglobin and supplement B; contaminating organisms inhibited by colistin, nystatin, vancomycin, and trimethoprim	Selective for *N. gonorrhoeae* and *N. meningitidis*. Supports the growth of *Francisella* and *Brucella* spp.

581. The reason why some bacteria are anaerobes is because:

a) They lack catalase and oxidase enzymes
b) They have special mitochondria that do not function in the presence of oxygen
c) They do not have catalase and superoxide dismutase
d) Gene transcription for pilus protein in suppressed in the presence of oxygen
e) They ferment sugars well

KEY c

The enzymes catalase and superoxide dismutase (SOD) help bacteria (and other aerobic organisms) to neutralize reactive oxygen species (ROS), which are highly reactive molecules that can cause cellular damage.

Catalase:

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

SOD:

$$2O_2^- + 2H^+ \rightarrow H_2O_2 + O_2$$

582. Antibiotics that act by inhibiting the synthesis of bacterial cell wall and protein synthesis are most effective in which of phase of the bacterial growth cycle

a) Lag
b) Log
c) Stationary
d) Statutory
e) Death

KEY b

583. A prokaryotic cell has the following structural component which is lacking in a eukaryotic cell

a) Paired chromosomes
b) Peptidoglycan
c) Lysosomes
d) Histones
e) Mitochondria

KEY b

584. A lab technologist was working in the lab when she accidentally dropped one of the vials she was carrying andit broke on the floor. It contained a highly pathogenic virus. Which agent would you advise her to use to get maximum disinfection?

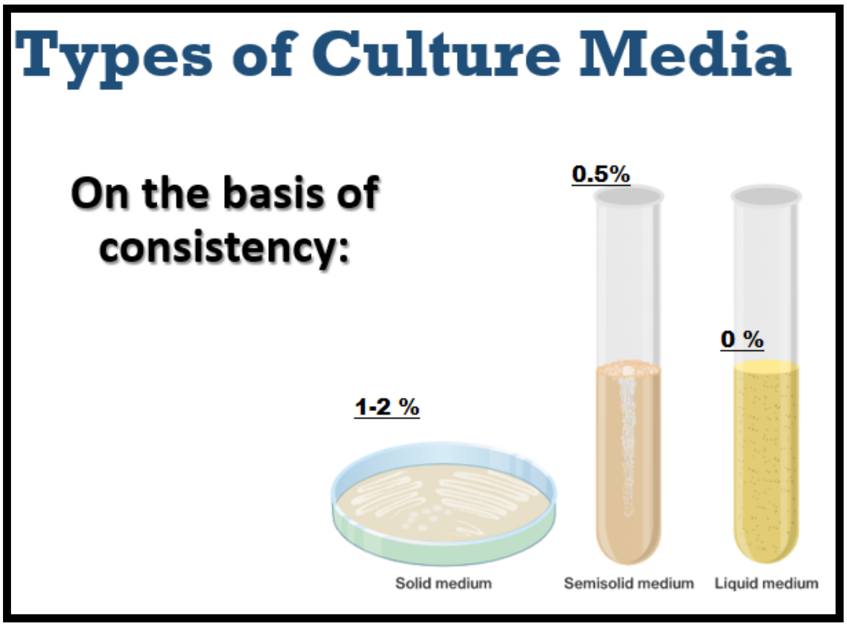
a) Ethanol
b) Hexachlorophene
c) Phenols
d) Iodophors
e) Hypochlorite

KEY e

585. Which of the following is used as a solidifying agent for media?

a) Beef extract
b) Peptone
c) Agar
d) Yeast extract

Key c


Types of Culture Media
On the basis of consistency:
1-2 %
0.5%
0 %
Solid medium
Semisolid medium
Liquid medium

586. The isolation of gonorrhea-causing organism, Neisseria gonorrhoeae by the use of certain antibiotics in media is an example of which of the following?

a) Selective media
b) Differential media
c) Enriched media
d) Chromogenic media

Key a

EMB Agar
MacConkey Agar
XLD Agar
Bacterial Culture Media
Blood Agar
Chocolate Agar
Nutrient Agar

587. MacConkey's agar is both Selective and Differential media used primarily for the isolation of gram-negative bacteria. Which component inhibits the growth of gram-positive bacteria?

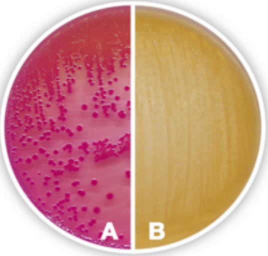
a) Blood
b) Peptone
c) Bile salts
d) Tryptophan

Key c (prefer crystal violet)

MacConkey Agar

Composition:

Mnemonic "PLANT"



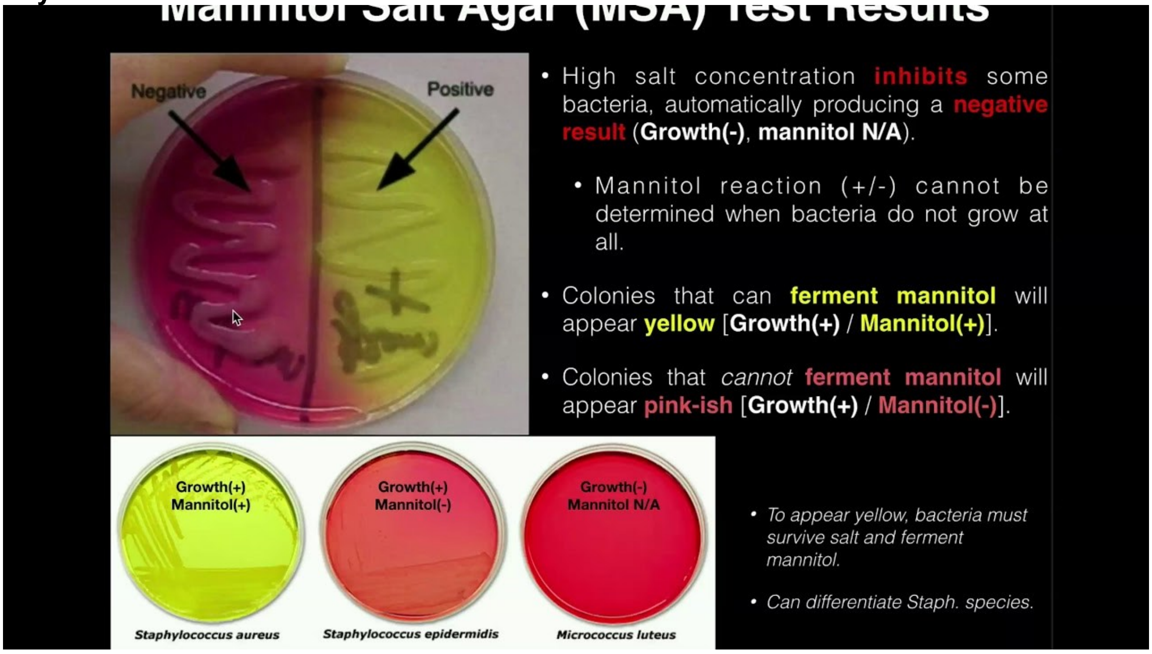
P - Peptone
L - Lactose
A - Agar
N - Neutral red (indicator)
T - Taurocholate (Bile salts)

588. To differentiate between lactose and non-lactose fermentors, the medium used is

a. Selective medium
b. Blood Agar
c. Tetrathionate broth
d. MacConkey's Agar
Key d

589. Mannitol Salt agar is both selective and differential media. It is used for the isolation of
a) Micrococcus spp
b) Streptococcus spp
c) Staphylococcus spp
d) Corynebacterium spp

Key c



Mannitol Salt Agar (MSA) Test Results

- High salt concentration **inhibits** some bacteria, automatically producing a **negative result** (**Growth(-)**, **mannitol N/A**).
  - Mannitol reaction (+/-) cannot be determined when bacteria do not grow at all.
- Colonies that can **ferment mannitol** will appear **yellow** [**Growth(+)** / **Mannitol(+)**].
- Colonies that *cannot* **ferment mannitol** will appear **pink-ish** [**Growth(+)** / **Mannitol(-)**].

- *To appear yellow, bacteria must survive salt and ferment mannitol.*
- *Can differentiate Staph. species.*

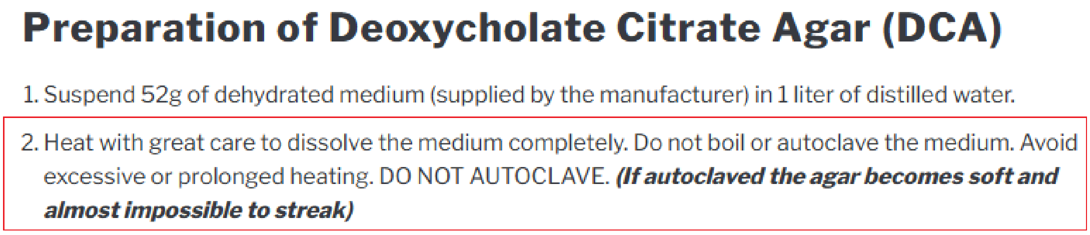
Negative
Positive
Growth(+)
Mannitol(+)
Growth(+)
Mannitol(-)
Growth(-)
Mannitol N/A
Staphylococcus aureus
Staphylococcus epidermidis
Micrococcus luteus

590. Which of following statements is correct?
a) Agar has nutrient properties.
b) Chocolate medium is a selective medium
c) Nutrient broth is simple medium

d) Indicator added to medium enhances growth of microorganisms.
Key c

Nutrient broth is considered a simple medium because it provides basic nutrients (like peptones and beef extract) necessary for the growth of a wide variety of microorganisms, without any special additives or enrichment.

591. Which of the following media are considered heat sensitive?
a) Nutrient agar
b) CLED medium
c) Deoxycholate citrate agar
d) DNAse agar
Key CORRECTED = C



Preparation of Deoxycholate Citrate Agar (DCA)

1. Suspend 52g of dehydrated medium (supplied by the manufacturer) in 1 liter of distilled water.
2. Heat with great care to dissolve the medium completely. Do not boil or autoclave the medium. Avoid excessive or prolonged heating. DO NOT AUTOCLAVE. ***(If autoclaved the agar becomes soft and almost impossible to streak)***

592. Which of the following are suitable for cultivation of Anaerobic organisms

a. Robertson cooked-meat medium
b. Nutrient agar
c. Wilikin's –Chalgren medium
Key a (A >C…stem weird and wrong)

593. Sabouraud's agar is used for in vitro growth of
a) Bacteria except anaerobes
b) Fungi
c) Fastidious microorganisms only
d) Candida spp only
Key b

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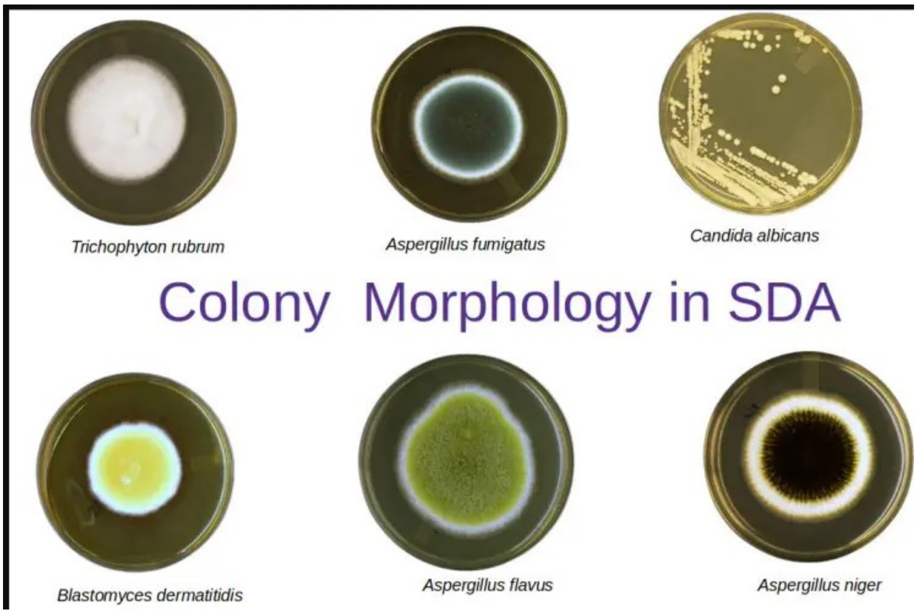
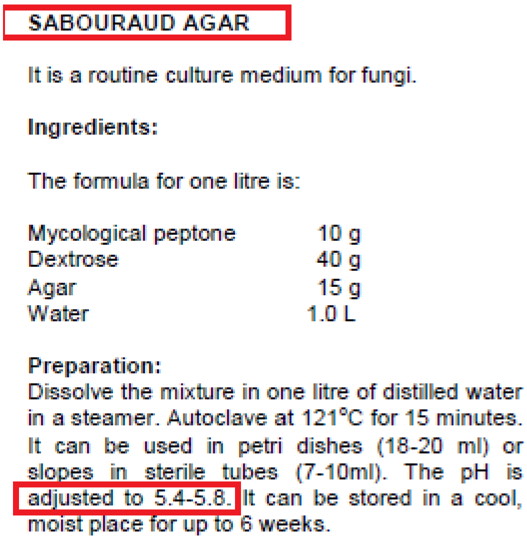

Trichophyton rubrum
Aspergillus fumigatus
Candida albicans
Colony Morphology in SDA
Blastomyces dermatitidis
Aspergillus flavus
Aspergillus niger



SABOURAUD AGAR

It is a routine culture medium for fungi.

Ingredients:

The formula for one litre is:

Mycological peptone	10 g
Dextrose	40 g
Agar	15 g
Water	1.0 L

Preparation:
Dissolve the mixture in one litre of distilled water in a steamer. Autoclave at 121°C for 15 minutes. It can be used in petri dishes (18-20 ml) or slopes in sterile tubes (7-10ml). The pH is adjusted to 5.4-5.8. It can be stored in a cool, moist place for up to 6 weeks.

594. A Capsule is a layer lying outside the bacterial cell and can be found both gram positive and gram negative bacteria.It is composed of
- a) Lipopolysaccharide layer
- b) Polysaccharide
- c) Phospholipids
- d) Lipid bilayer

Key b

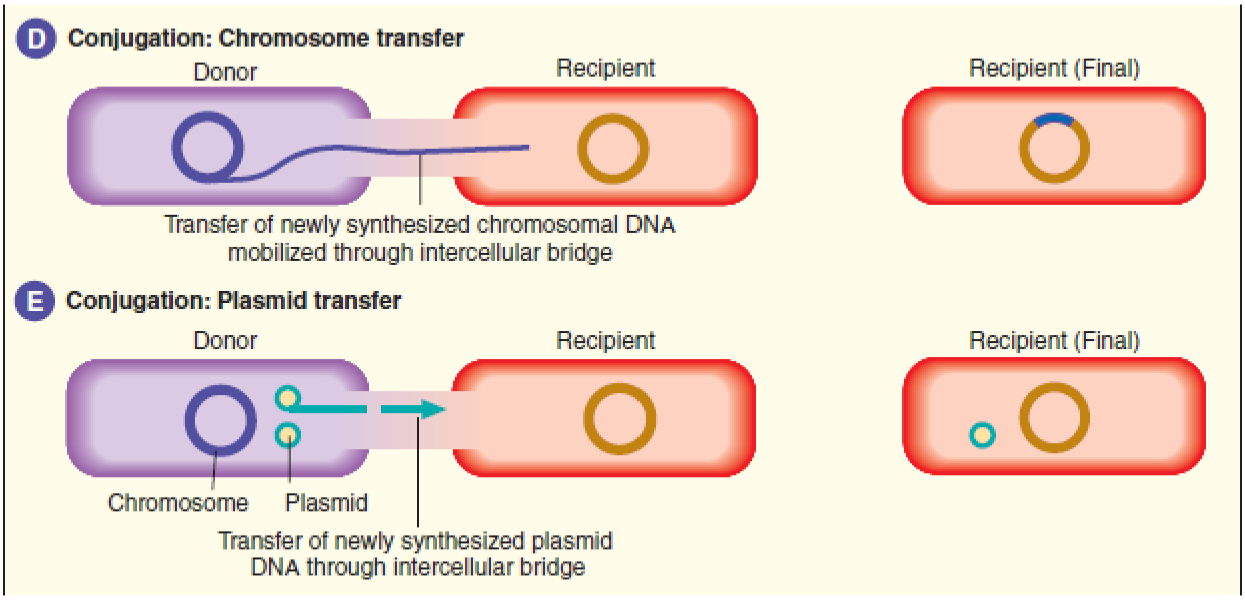
595. All of the following are common bacteriological stains Except:
- a) Sudan B black
- b) Methylene blue
- c) Malachite green
- d) Crystal violet

Key a

596. Which of the following structures contains genes for enzymes and antibiotic resistance?

- a. Plasmid
- b. Pilus
- c. Capsule
- d. Periplasmic space

Key a

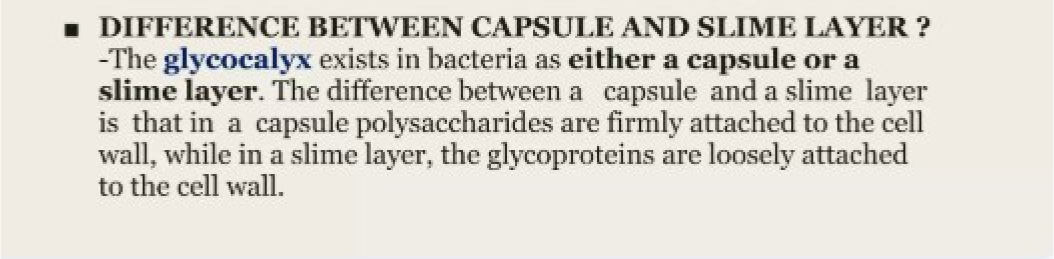

D Conjugation: Chromosome transfer
Donor
Recipient
Recipient (Final)
Transfer of newly synthesized chromosomal DNA mobilized through intercellular bridge
E Conjugation: Plasmid transfer
Donor
Recipient
Recipient (Final)
Chromosome
Plasmid
Transfer of newly synthesized plasmid DNA through intercellular bridge

597. Which of the following is the most important structure related to microbial attachment to cells?

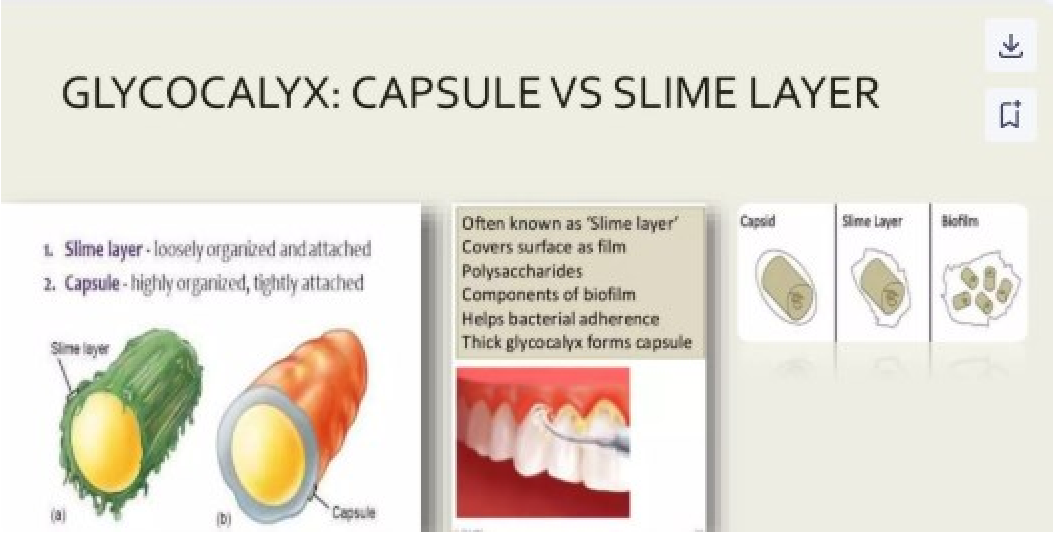
a. Flagellum
b. Plasmid
c. Peptidoglycan
d. Glycocalyx
Key d

Glycocalyx (Slime Layer)

The glycocalyx is a polysaccharide coating that is secreted by many bacteria. It covers surfaces like a film and allows the bacteria to **adhere firmly** to various structures (e.g., skin, heart valves, prosthetic joints, and catheters). The glycocalyx is an important component of biofilms (see page 36). The medical importance of the glycocalyx is illustrated by the finding that it is the glycocalyx-producing strains of *P. aeruginosa* that cause respiratory tract infections in cystic fibrosis patients, and it is the glycocalyx-producing strains of *Staphylococcus epidermidis* and viridans streptococci that cause endocarditis. The glycocalyx also mediates adherence of certain bacteria to the surface of teeth. This plays an important role in the formation of plaque.



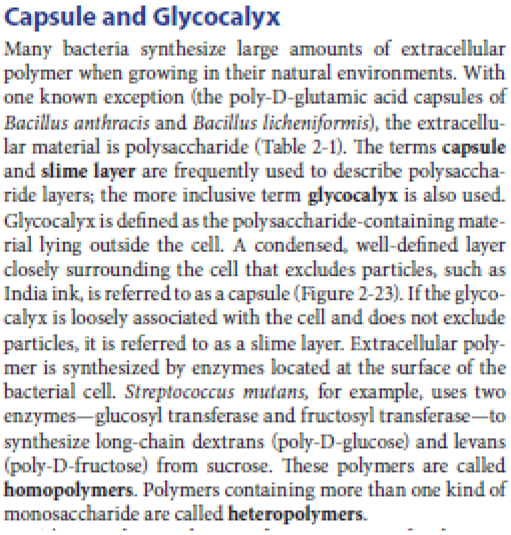
- **DIFFERENCE BETWEEN CAPSULE AND SLIME LAYER ?**
  -The **glycocalyx** exists in bacteria as **either a capsule or a slime layer**. The difference between a capsule and a slime layer is that in a capsule polysaccharides are firmly attached to the cell wall, while in a slime layer, the glycoproteins are loosely attached to the cell wall.



GLYCOCALYX: CAPSULE VS SLIME LAYER

1. **Slime layer** - loosely organized and attached
2. **Capsule** - highly organized, tightly attached

Often known as 'Slime layer'
Covers surface as film
Polysaccharides
Components of biofilm
Helps bacterial adherence
Thick glycocalyx forms capsule



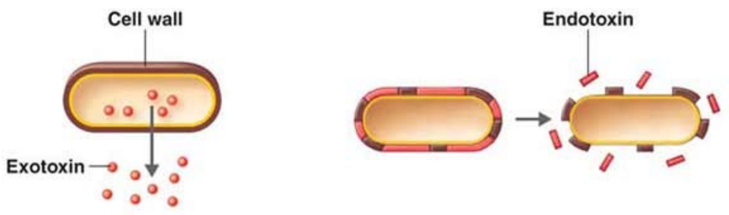
Capsule and Glycocalyx

Many bacteria synthesize large amounts of extracellular polymer when growing in their natural environments. With one known exception (the poly-D-glutamic acid capsules of *Bacillus anthracis* and *Bacillus licheniformis*), the extracellular material is polysaccharide (Table 2-1). The terms **capsule** and **slime layer** are frequently used to describe polysaccharide layers; the more inclusive term **glycocalyx** is also used. Glycocalyx is defined as the polysaccharide-containing material lying outside the cell. A condensed, well-defined layer closely surrounding the cell that excludes particles, such as India ink, is referred to as a capsule (Figure 2-23). If the glycocalyx is loosely associated with the cell and does not exclude particles, it is referred to as a slime layer. Extracellular polymer is synthesized by enzymes located at the surface of the bacterial cell. *Streptococcus mutans*, for example, uses two enzymes—glucosyl transferase and fructosyl transferase—to synthesize long-chain dextrans (poly-D-glucose) and levans (poly-D-fructose) from sucrose. These polymers are called **homopolymers**. Polymers containing more than one kind of monosaccharide are called **heteropolymers**.

598. All of the following are true related to endotoxins except ?

a. Endotoxins are secreted from cells.
b. Can be linked to Meningococcemia
c. Produced by gram negative microorganisms
d. Can cause fever
Key a

Differences Between Exotoxins and Endotoxins



(a) Exotoxins are proteins produced inside pathogenic bacteria, most commonly gram-positive bacteria, as part of their growth and metabolism. The exotoxins are then secreted or released into the surrounding medium following lysis.

(b) Endotoxins are the lipid portions of lipopolysaccharides (LPSs) that are part of the outer membrane of the cell wall of gram-negative bacteria (lipid A; see Figure 4.13c). The endotoxins are liberated when the bacteria die and the cell wall breaks apart.

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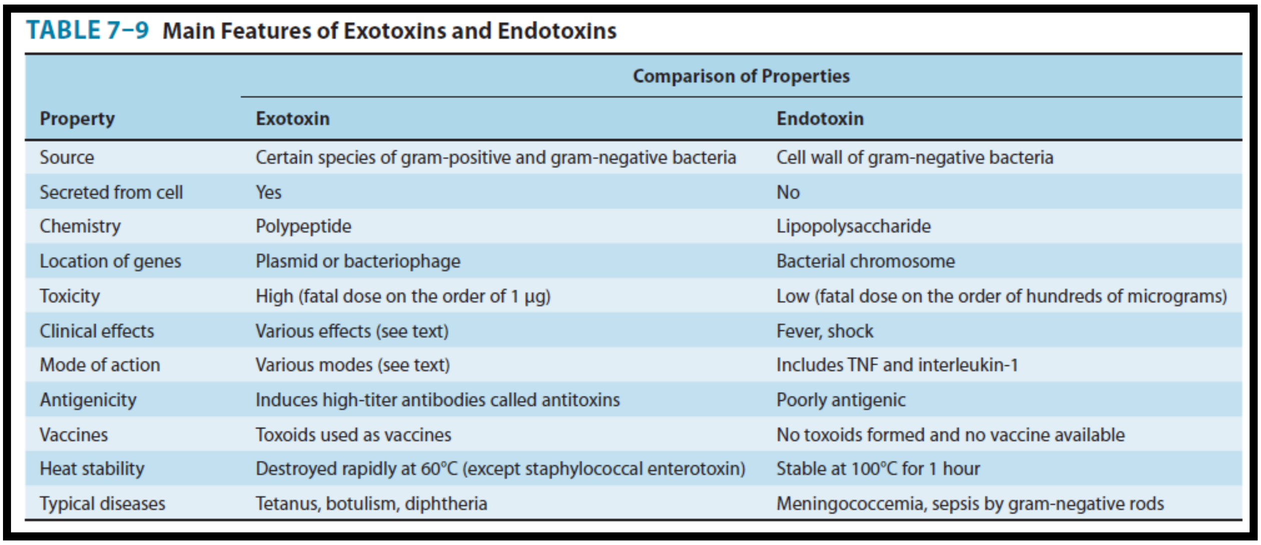
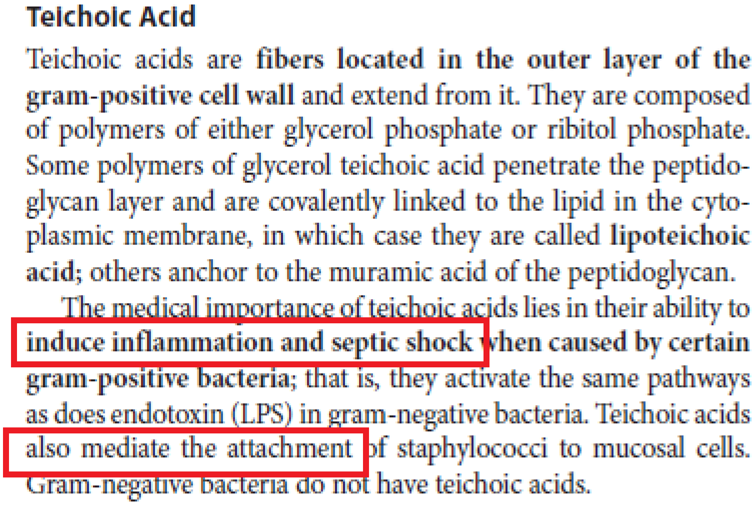


TABLE 7–9 **Main Features of Exotoxins and Endotoxins**

	Comparison of Properties	
Property	**Exotoxin**	**Endotoxin**
Source	Certain species of gram-positive and gram-negative bacteria	Cell wall of gram-negative bacteria
Secreted from cell	Yes	No
Chemistry	Polypeptide	Lipopolysaccharide
Location of genes	Plasmid or bacteriophage	Bacterial chromosome
Toxicity	High (fatal dose on the order of 1 µg)	Low (fatal dose on the order of hundreds of micrograms)
Clinical effects	Various effects (see text)	Fever, shock
Mode of action	Various modes (see text)	Includes TNF and interleukin-1
Antigenicity	Induces high-titer antibodies called antitoxins	Poorly antigenic
Vaccines	Toxoids used as vaccines	No toxoids formed and no vaccine available
Heat stability	Destroyed rapidly at 60°C (except staphylococcal enterotoxin)	Stable at 100°C for 1 hour
Typical diseases	Tetanus, botulism, diphtheria	Meningococcemia, sepsis by gram-negative rods

599. The cell wall of gram-positive bacteria may contribute to the development of septic shock. Identify the component which is most associated with the induction of septic shock.

a) Capsular protein
b) Endotoxin
c) Peptidoglycan
d) Teichoic acid
Key d



Teichoic Acid

Teichoic acids are **fibers located in the outer layer of the gram-positive cell wall** and extend from it. They are composed of polymers of either glycerol phosphate or ribitol phosphate. Some polymers of glycerol teichoic acid penetrate the peptidoglycan layer and are covalently linked to the lipid in the cytoplasmic membrane, in which case they are called **lipoteichoic acid**; others anchor to the muramic acid of the peptidoglycan.

The medical importance of teichoic acids lies in their ability to **induce inflammation and septic shock when caused by certain gram-positive bacteria**; that is, they activate the same pathways as does endotoxin (LPS) in gram-negative bacteria. Teichoic acids also mediate the attachment of staphylococci to mucosal cells. Gram-negative bacteria do not have teichoic acids.

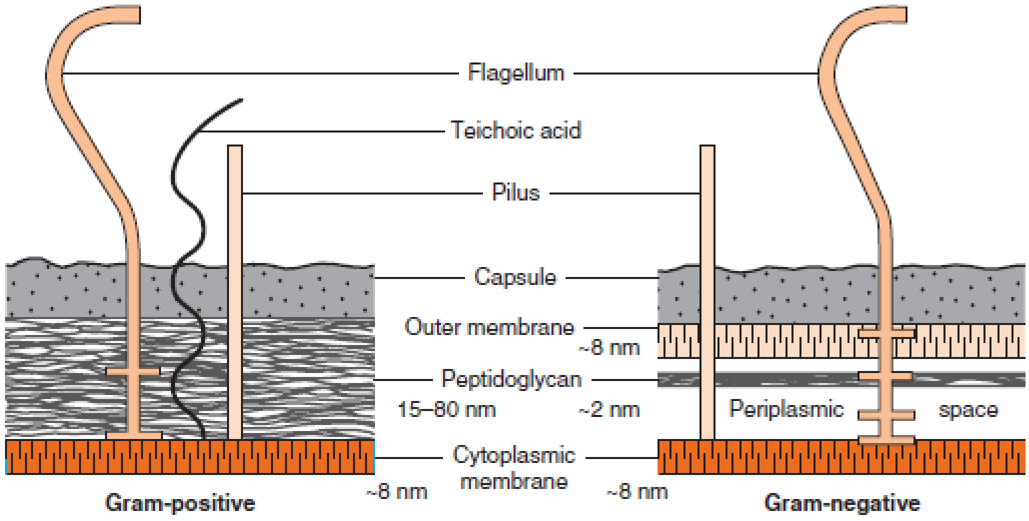

Flagellum
Teichoic acid
Pilus
Capsule
Outer membrane
~8 nm
Peptidoglycan
15–80 nm
~2 nm
Periplasmic space
Cytoplasmic membrane
~8 nm
~8 nm
Gram-positive
Gram-negative
A

TABLE 2–2 Comparison of Cell Walls of Gram-Positive and Gram-Negative Bacteria

Component	Gram-Positive Cells	Gram-Negative Cells
Peptidoglycan	Thicker; multilayer	Thinner; single layer
Teichoic acids	Yes	No
Lipopolysaccharide (endotoxin)	No	Yes

600. Gram staining is an example for

a. Simple staining
b. Differential staining
c. Negative staining
d. None of these
Key b

601. Differences between Gram positive and Gram-negative bacteria is shown to reside in the

a. Cell wall thickness
b. Capsule
c. Cell membrane thickness
d. Charge on lipid bilayer
Key a

602. The action of alcohol during Gram-staining is

a. Allows the background color to darken
b. Allows better penetration of counterstain
c. Decolorizes the cells
d. None of these
Key c

603. Coagulase test is used for

a. Salmonella
b. Staphylococcus
c. Bordetella
d. Pneumococcus
Key b

604. What groups listed below does not have true cell walls?
- a. Mycoplasmas
- b. Gram-positive bacteria
- c. fungi
- d. protozoans

Key a

605. The main difference in true bacteria and Mycoplasma is that it does not possess –

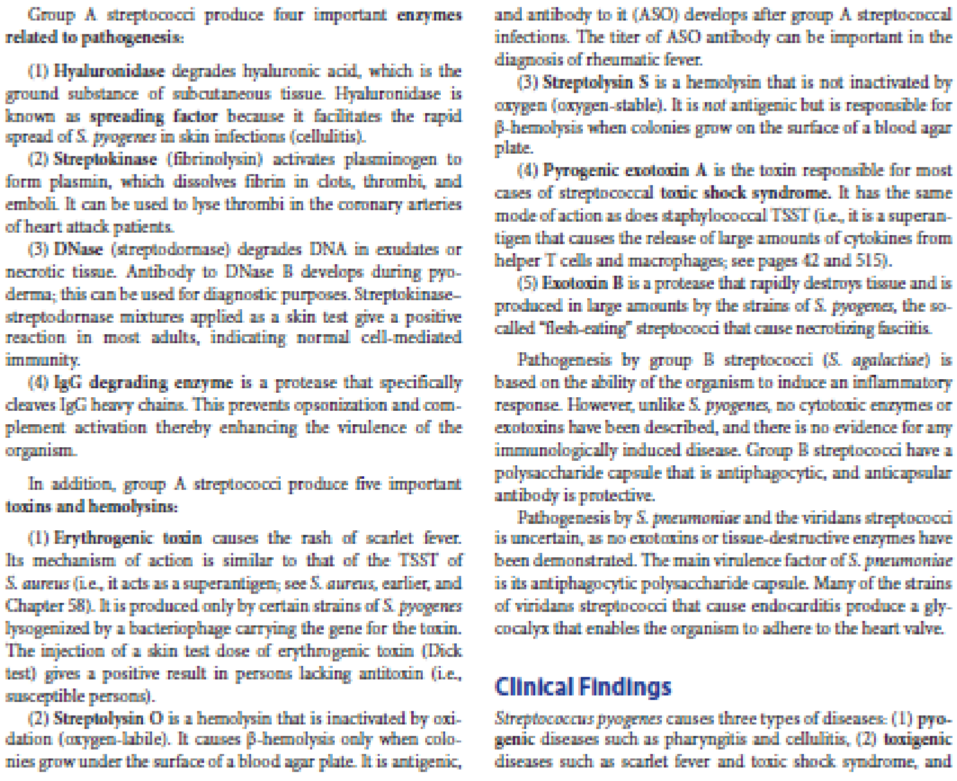
- a. Flagella
- b. Cell wall
- c. Cell membrane
- d. Capsule

Key b

606. Toxins or enzymes which are not produced by Streptococcus pyogenes

- a. Hyaluronides
- b. Catalase
- c. Hemolysin
- d. Streptokinase

Key b



Group A streptococci produce four important **enzymes related to pathogenesis:**

(1) **Hyaluronidase** degrades hyaluronic acid, which is the ground substance of subcutaneous tissue. Hyaluronidase is known as **spreading factor** because it facilitates the rapid spread of *S. pyogenes* in skin infections (cellulitis).

(2) **Streptokinase** (fibrinolysin) activates plasminogen to form plasmin, which dissolves fibrin in clots, thrombi, and emboli. It can be used to lyse thrombi in the coronary arteries of heart attack patients.

(3) **DNase** (streptodornase) degrades DNA in exudates or necrotic tissue. Antibody to DNase B develops during pyoderma; this can be used for diagnostic purposes. Streptokinase–streptodornase mixtures applied as a skin test give a positive reaction in most adults, indicating normal cell-mediated immunity.

(4) **IgG degrading enzyme** is a protease that specifically cleaves IgG heavy chains. This prevents opsonization and complement activation thereby enhancing the virulence of the organism.

In addition, group A streptococci produce five important **toxins and hemolysins:**

(1) **Erythrogenic toxin** causes the rash of scarlet fever. Its mechanism of action is similar to that of the TSST of *S. aureus* (i.e., it acts as a superantigen; see *S. aureus*, earlier, and Chapter 58). It is produced only by certain strains of *S. pyogenes* lysogenized by a bacteriophage carrying the gene for the toxin. The injection of a skin test dose of erythrogenic toxin (Dick test) gives a positive result in persons lacking antitoxin (i.e., susceptible persons).

(2) **Streptolysin O** is a hemolysin that is inactivated by oxidation (oxygen-labile). It causes β-hemolysis only when colonies grow under the surface of a blood agar plate. It is antigenic, and antibody to it (ASO) develops after group A streptococcal infections. The titer of ASO antibody can be important in the diagnosis of rheumatic fever.

(3) **Streptolysin S** is a hemolysin that is not inactivated by oxygen (oxygen-stable). It is *not* antigenic but is responsible for β-hemolysis when colonies grow on the surface of a blood agar plate.

(4) **Pyrogenic exotoxin A** is the toxin responsible for most cases of streptococcal **toxic shock syndrome.** It has the same mode of action as does staphylococcal TSST (i.e., it is a superantigen that causes the release of large amounts of cytokines from helper T cells and macrophages; see pages 42 and 515).

(5) **Exotoxin B** is a protease that rapidly destroys tissue and is produced in large amounts by the strains of *S. pyogenes*, the so-called "flesh-eating" streptococci that cause necrotizing fasciitis.

Pathogenesis by group B streptococci (*S. agalactiae*) is based on the ability of the organism to induce an inflammatory response. However, unlike *S. pyogenes*, no cytotoxic enzymes or exotoxins have been described, and there is no evidence for any immunologically induced disease. Group B streptococci have a polysaccharide capsule that is antiphagocytic, and anticapsular antibody is protective.

Pathogenesis by *S. pneumoniae* and the viridans streptococci is uncertain, as no exotoxins or tissue-destructive enzymes have been demonstrated. The main virulence factor of *S. pneumoniae* is its antiphagocytic polysaccharide capsule. Many of the strains of viridans streptococci that cause endocarditis produce a glycocalyx that enables the organism to adhere to the heart valve.

Clinical Findings

Streptococcus pyogenes causes three types of diseases: (1) **pyogenic** diseases such as pharyngitis and cellulitis, (2) **toxigenic** diseases such as scarlet fever and toxic shock syndrome, and

607. Which of the following is not true concerning Staphylococcus aureus?

- a. S. aureus is related to bacteremia.
- b. S. aureus can cause pneumonia
- c. S. aureus can lead to acute bacterial endocarditis
- d. S. aureus does not make coagulase

Key d

608. Where does the Streptococcus mutans adhere to the body site?
- a) intestinal tract
- b) tongue

c) teeth
d) hairs

Key c

609. Streptococci are common resident flora of_______.

a. colon
b. Duodenum
c. mouth
d. Skin
Key c

610. Superoxide ion is toxic to strict anaerobes because they lack

a) catalase
b) peroxidase
c) dismutase
d) oxidase
Key c

The enzymes catalase and superoxide dismutase (SOD) help bacteria (and other aerobic organisms) to neutralize reactive oxygen species (ROS), which are highly reactive molecules that can cause cellular damage.

Catalase:

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

SOD:

$$2O_2^- + 2H^+ \rightarrow H_2O_2 + O_2$$

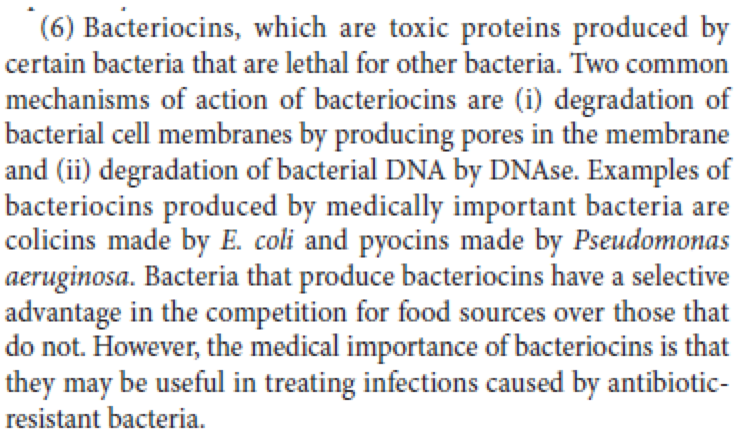
611. Microbial control methods that kills the following are able to sterilize.
a) viruses
b) the tubercle bacillus
c) endospores
d) cysts
Key c

612. The temperature-pressure combination for an autoclave is

a) 100^{o}C and 4 psi
b) 121^{o}C and 15 psi
c) 131^{o}C and 9 psi
d) 115^{o}C and 3 psi
Key b

613. A compound synthesized by bacteria or fungi that destroys or inhibits the growth of other microbes is a/an

a) synthetic drug
b) antibiotic
c) antimicrobial drug
d) competitive inhibitor
Key b CORRECTED ANSWER = BACTERIOCIN



(6) Bacteriocins, which are toxic proteins produced by certain bacteria that are lethal for other bacteria. Two common mechanisms of action of bacteriocins are (i) degradation of bacterial cell membranes by producing pores in the membrane and (ii) degradation of bacterial DNA by DNAse. Examples of bacteriocins produced by medically important bacteria are colicins made by *E. coli* and pyocins made by *Pseudomonas aeruginosa*. Bacteria that produce bacteriocins have a selective advantage in the competition for food sources over those that do not. However, the medical importance of bacteriocins is that they may be useful in treating infections caused by antibiotic-resistant bacteria.

614. Which of the following modes of action would be most selectively toxic?

a) interrupting ribosomal function
b) dissolving the cell membrane
c) preventing cell wall synthesis
d) inhibiting DNA replication
Key c

Selective toxicity refers to a drug's ability to target the microorganism without harming the host.

615. Which normal flora produces lactic acid from the fermentation of glycogen in the female vagina?

a. Candida albicans
b. Lactobacilli
c. Group B streptococcus
d. E.coli
Key b

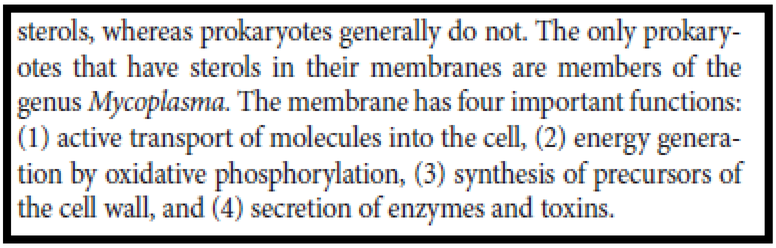
616. All of the below give relatively good results on Gram staining except
a) Organisms containing sterol in their cell wall
b) Organisms with thin cell walls
c) Organisms lacking cell wall
d) Organisms having outer capsule preventing dye penetration
Key c

617. Counterstain commonly employed in our laboratory for Gram staining is

a. Crystal violet
b. Safranin
c. Diluted carbol fuchsin
d. Methylene blue
Key ANSWER CORRECTED B.. SAFRANIN > DIL CARBOL

618. The purpose of cell membrane is to

a. Provide rigid support to the bacteria
b. Transport of nutrients across the cell
c. Shape of the bacteria
d. Harbors the endotoxin causing sepsis
Key b



sterols, whereas prokaryotes generally do not. The only prokaryotes that have sterols in their membranes are members of the genus *Mycoplasma*. The membrane has four important functions: (1) active transport of molecules into the cell, (2) energy generation by oxidative phosphorylation, (3) synthesis of precursors of the cell wall, and (4) secretion of enzymes and toxins.

619. Temperature used for hot air oven is

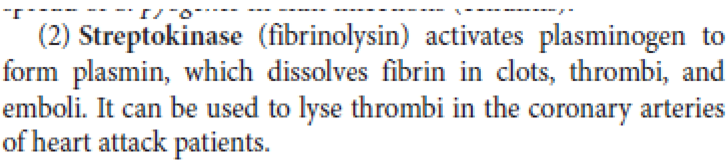
a.100°C for 1 hour
b.120°C for 1 hour
c.160°C for 1 hour
d. 60°C for 1 hour
Key c

620. Drug of choice for methicillin resistant Staphylococcus aureus is

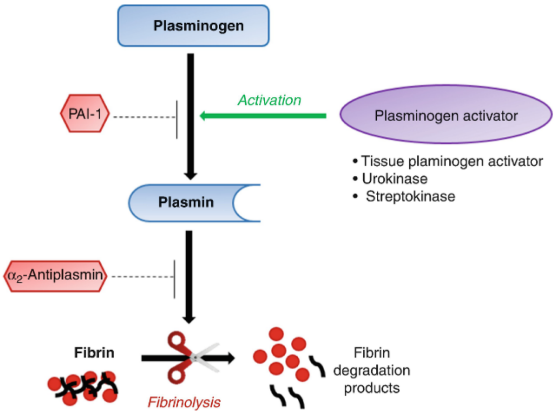
a. Ampicillin
b. Erythromycin
c. Neomycin
d. Vancomycin
Key d

621. Streptokinase is also termed as

a. Fibrionolysin
b. Catalase
c. Coagulase
d. Hyaluronidase
Key a



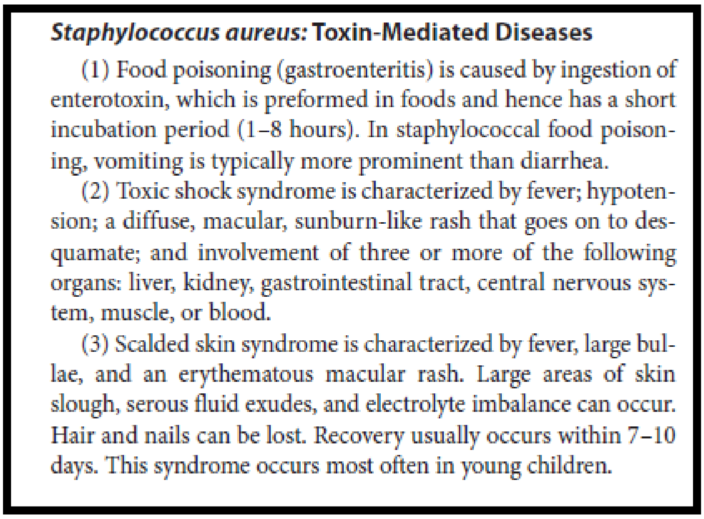
(2) **Streptokinase** (fibrinolysin) activates plasminogen to form plasmin, which dissolves fibrin in clots, thrombi, and emboli. It can be used to lyse thrombi in the coronary arteries of heart attack patients.


Plasminogen
PAI-1
Activation
Plasminogen activator
• Tissue plaminogen activator
• Urokinase
• Streptokinase
Plasmin
α_2-Antiplasmin
Fibrin
Fibrinolysis
Fibrin degradation products

622. Which of the following bacteria cannot survive without oxygen?
a) Escherichia coli
b) Pseudomonas aeruginosa
c) Bacteroides fragilis
d) None of the above
Key b

623. Which of the following is a toxin mediated disease caused by Staphyloccus aureus?

a. Food poisoning
b. Pneumonia
c. Sepsis
d. None of the above
Key a



Staphylococcus aureus: Toxin-Mediated Diseases

(1) Food poisoning (gastroenteritis) is caused by ingestion of enterotoxin, which is preformed in foods and hence has a short incubation period (1–8 hours). In staphylococcal food poisoning, vomiting is typically more prominent than diarrhea.

(2) Toxic shock syndrome is characterized by fever; hypotension; a diffuse, macular, sunburn-like rash that goes on to desquamate; and involvement of three or more of the following organs: liver, kidney, gastrointestinal tract, central nervous system, muscle, or blood.

(3) Scalded skin syndrome is characterized by fever, large bullae, and an erythematous macular rash. Large areas of skin slough, serous fluid exudes, and electrolyte imbalance can occur. Hair and nails can be lost. Recovery usually occurs within 7–10 days. This syndrome occurs most often in young children.

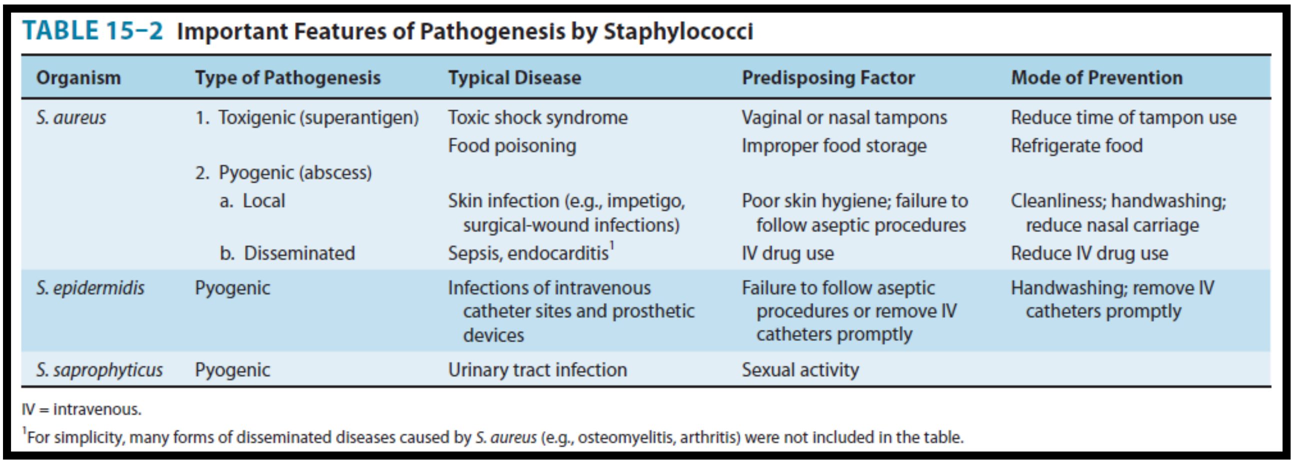


TABLE 15–2 Important Features of Pathogenesis by Staphylococci

Organism	Type of Pathogenesis	Typical Disease	Predisposing Factor	Mode of Prevention
S. aureus	1. Toxigenic (superantigen)	Toxic shock syndrome	Vaginal or nasal tampons	Reduce time of tampon use
		Food poisoning	Improper food storage	Refrigerate food
	2. Pyogenic (abscess)			
	a. Local	Skin infection (e.g., impetigo, surgical-wound infections)	Poor skin hygiene; failure to follow aseptic procedures	Cleanliness; handwashing; reduce nasal carriage
	b. Disseminated	Sepsis, endocarditis[1]	IV drug use	Reduce IV drug use
S. epidermidis	Pyogenic	Infections of intravenous catheter sites and prosthetic devices	Failure to follow aseptic procedures or remove IV catheters promptly	Handwashing; remove IV catheters promptly
S. saprophyticus	Pyogenic	Urinary tract infection	Sexual activity	

IV = intravenous.

[1] For simplicity, many forms of disseminated diseases caused by *S. aureus* (e.g., osteomyelitis, arthritis) were not included in the table.

624. All of the following statements are false regarding colonization resistance except (basically asking what is true)

a. Enhanced in the presence of antibiotics
b. Increases in presence of the pathogens
c. A function of normal microbiota
d. Allows for propagation of the pathogenic bacteria
Key CORRECTED = C

625. The following sites in the human intestinal tract has the lowest load of bacteria belonging to normal flora

a. Descending Colon
b. Stomach
c. Terminal ileum
d. Duodenum
Key b

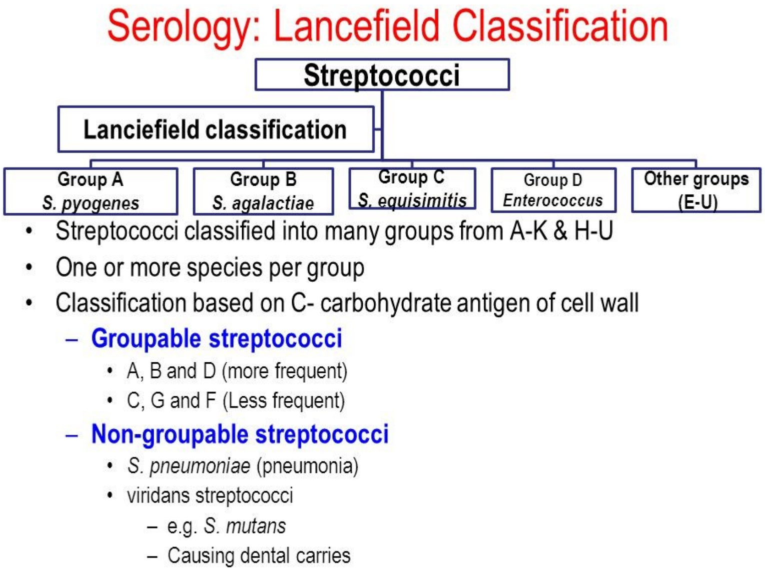
626. Common skin anaerobe implicated in etiology of acne is

a. Eubacterium
b. Fusobacterium
c. Peptococcus
d. Propionibacterium
Key d

627. All of the following are part of human normal flora except

a. Bacteria
b. Fungi
c. Viruses
d. Prions
Key d **POOR QUALITY**

628. Beta hemolytyic streptococci are divived into Lancefield groups based on
a) C carbohydrate
b) Bile solubility
c) M protein
d) Cell wall thickness
Key a



Serology: Lancefield Classification

Streptococci

Lanciefield classification

Group A *S. pyogenes*
Group B *S. agalactiae*
Group C *S. equisimitis*
Group D *Enterococcus*
Other groups (E-U)

- Streptococci classified into many groups from A-K & H-U
- One or more species per group
- Classification based on C- carbohydrate antigen of cell wall
  - **Groupable streptococci**
    - A, B and D (more frequent)
    - C, G and F (Less frequent)
  - **Non-groupable streptococci**
    - *S. pneumoniae* (pneumonia)
    - viridans streptococci
      - e.g. *S. mutans*
      - Causing dental carries

629. Gram stain can be used to differentiate between Staphylococci and streptococci due to difference in
a) Color of these bacteria
b) Cell arrangement
c) Gram stain is not useful in differentiating between the two groups (as both stain same)
d) Shape of the organisms
Key b

630. Streptococcus pyogenes can be differentiated from other streptococci in lab by use of following laboratory test

a. Ability to grow in 6.5 % NaCl
b. Quellung reaction
c. Bile esculin hydrolysis
d. Inhibited by Bacitracin
Key d

631. Besides Staphylococcus aureus ,which of the following species of Streptococci can cause cellulitis?

a. Strep agalactiae
b. Strep viridans
c. Strep pyogenes
d. None of the above
Key c

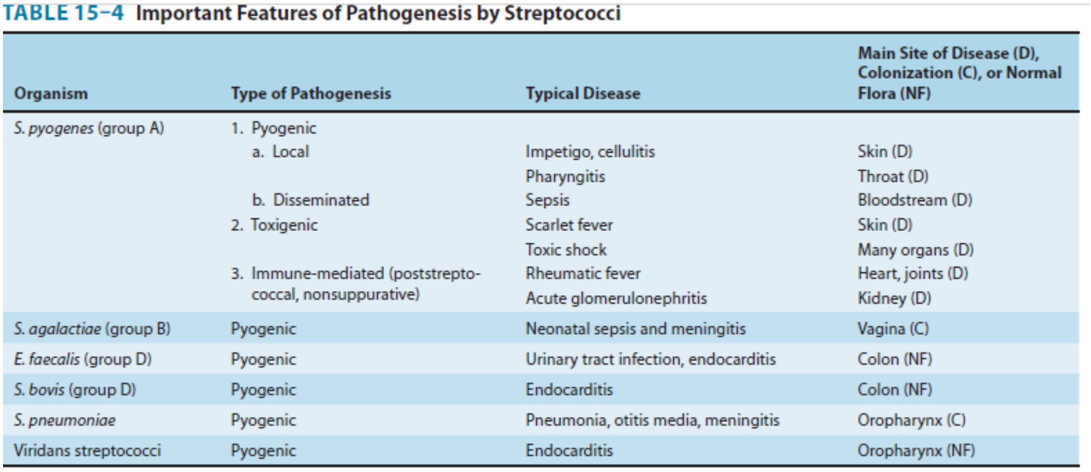


TABLE 15–4 Important Features of Pathogenesis by Streptococci

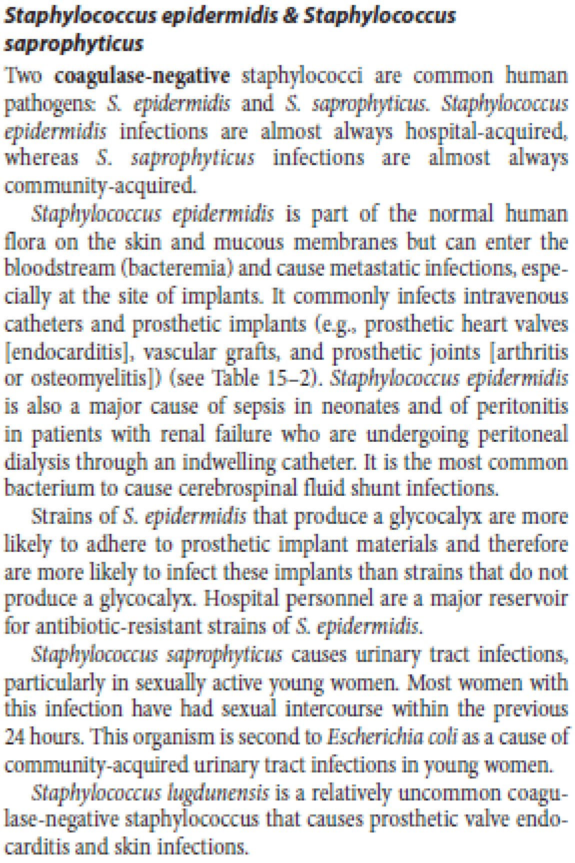
Organism	Type of Pathogenesis	Typical Disease	Main Site of Disease (D), Colonization (C), or Normal Flora (NF)
S. pyogenes (group A)	1. Pyogenic		
	a. Local	Impetigo, cellulitis	Skin (D)
		Pharyngitis	Throat (D)
	b. Disseminated	Sepsis	Bloodstream (D)
	2. Toxigenic	Scarlet fever	Skin (D)
		Toxic shock	Many organs (D)
	3. Immune-mediated (poststreptococcal, nonsuppurative)	Rheumatic fever	Heart, joints (D)
		Acute glomerulonephritis	Kidney (D)
S. agalactiae (group B)	Pyogenic	Neonatal sepsis and meningitis	Vagina (C)
E. faecalis (group D)	Pyogenic	Urinary tract infection, endocarditis	Colon (NF)
S. bovis (group D)	Pyogenic	Endocarditis	Colon (NF)
S. pneumoniae	Pyogenic	Pneumonia, otitis media, meningitis	Oropharynx (C)
Viridans streptococci	Pyogenic	Endocarditis	Oropharynx (NF)

632. In addition to local pyogenic inflammation, another mechanism of pathogenesis is exotoxin production. Among the Streptococcus species, which causes toxin mediated disease?

a. S.agalactiae
b. Enterccoccus
c. S.pyogenes
d. S.pneumoniae
Key c

633. Most common etiologic agent of prosthetic valve endocarditis is

a. S.aureus
b. S.epidermidis
c. S.bovis
d. Strep viridans
Key b



Staphylococcus epidermidis* & *Staphylococcus saprophyticus

Two **coagulase-negative** staphylococci are common human pathogens: *S. epidermidis* and *S. saprophyticus*. *Staphylococcus epidermidis* infections are almost always hospital-acquired, whereas *S. saprophyticus* infections are almost always community-acquired.

Staphylococcus epidermidis is part of the normal human flora on the skin and mucous membranes but can enter the bloodstream (bacteremia) and cause metastatic infections, especially at the site of implants. It commonly infects intravenous catheters and prosthetic implants (e.g., prosthetic heart valves [endocarditis], vascular grafts, and prosthetic joints [arthritis or osteomyelitis]) (see Table 15–2). *Staphylococcus epidermidis* is also a major cause of sepsis in neonates and of peritonitis in patients with renal failure who are undergoing peritoneal dialysis through an indwelling catheter. It is the most common bacterium to cause cerebrospinal fluid shunt infections.

Strains of *S. epidermidis* that produce a glycocalyx are more likely to adhere to prosthetic implant materials and therefore are more likely to infect these implants than strains that do not produce a glycocalyx. Hospital personnel are a major reservoir for antibiotic-resistant strains of *S. epidermidis*.

Staphylococcus saprophyticus causes urinary tract infections, particularly in sexually active young women. Most women with this infection have had sexual intercourse within the previous 24 hours. This organism is second to *Escherichia coli* as a cause of community-acquired urinary tract infections in young women.

Staphylococcus lugdunensis is a relatively uncommon coagulase-negative staphylococcus that causes prosthetic valve endocarditis and skin infections.

634. Iodine used in Gram stains serves as

a. Fixative
b. Mordant
c. Counterstain
d. Stabilizer
Key b

In the Gram staining procedure, iodine acts as a mordant, which is a substance that enhances the binding of the primary stain (crystal violet) to the bacterial cell wall.

635. In Gram staining,some bacteria retain the crystal violet stain after alcohol treatment. The bacteria is

a. Gram positive
b. Gram negative
c. Gram variable.
d. procedure is incomplete to answer this
Key a

636. Various modifications of Gram stain have been employed in different laboratories. The one commonly used in our lab is referred to as

a. Weigert's modification
b. Preston and Morrell's modification
c. Jensen's modification
d. Kopeloff's and Beerman modification
Key ANSWER B CORRECTED REF AFIP MANUAL

637. For best results ,Coagulase test should be performed by using
a) Human serum
b) Bovine plasma
c) Rabbit plasma
d) Rabbit serum
Key c

638. Which forms of infection are caused by Bacillus anthracis? Select one best combination.
a) Inhalation and Vector borne
b) Gastrointestinal and air borne
c) Cutaneous and sexually transmitted
d) Cutaneous, inhalation and Gastrointestinal
e) Cutaneous and inhalation
Key d

639. True infections with non-diphtheria Corynebacterium spp., such as C. jeikeium or C. striatum, are often in immunocompromised patients or patients who have had:
a) Insertion of hardware or prosthetic devices
b) Coronary artery bypass surgery
c) Vitamin B12 deficiency
d) A lengthy hospital stay
e) Complement deficiency
Key a

640. A 2 year old baby is brought to the ER with hematuria, fever and thrombocytopenia. Which of the following bacteria would most likely be isolated from the stool sample of this patient?

a) Aeromonas hydrophila
b) Enterobacter aerogenes
c) Escherichia coli O157:H7
d) Salmonella enteriditis
e) Shigella flexneri
Key c

641. Several hours after dinner, a 36 year old man experiences abdominal discomfort, nausea and vomiting. He had dined on sweet and sour chicken and egg fried rice. Which of the pair of organisms is responsible for the food poisoning?

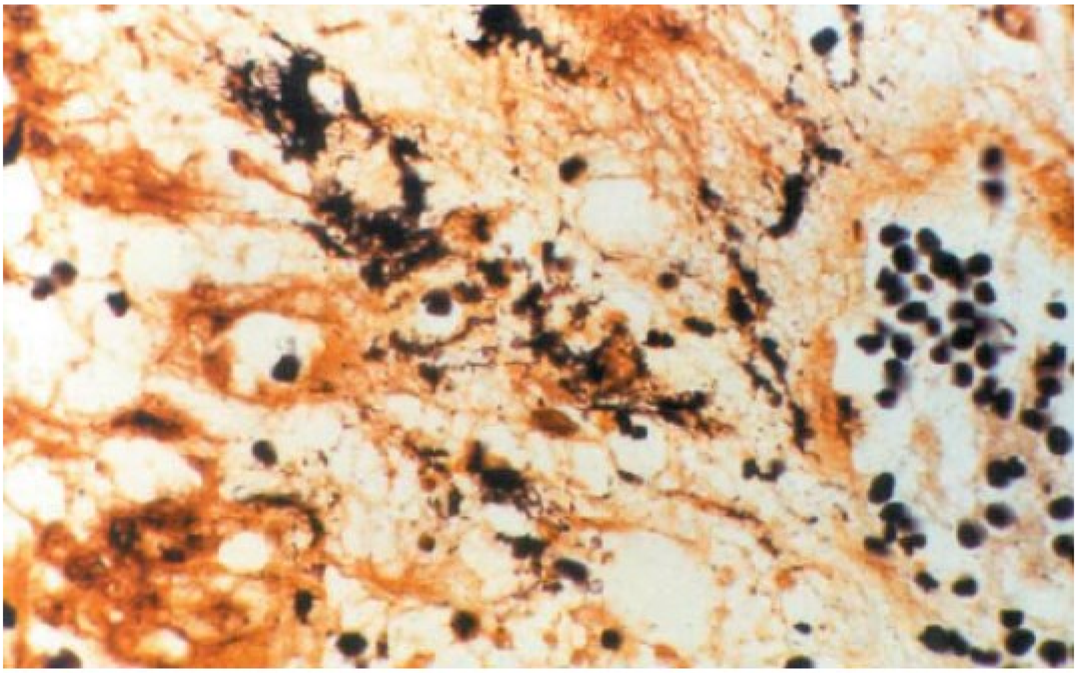
a) Clostridium botulinum + Bacillus anthracis
b) Clostridium difficile + Clostridium botulinum
c) Clostridium perfringens + Bacillus cereus
d) Clostridium tetani + Bacillus anthracis
e) Clostridium tetani + Bacillus cereus

Key c

642. A 10 year old boy presented to the ER with complaints of enlarged painful axillary lymph node. He gave history of a cat scratch a day back. The lymph node was aspirated. A warthin starry stain reveals highly pleomorphic rod shaped Bacteria. Which of the following is the most likely cause of infection?

a) Bartonella henslae
b) Brucella canis
c) Mycobacterium scrofulaceum
d) Yersinia pestis
e) Yersinia enterocolitica

Key a



- Silver-impregnation technique (Warthin-Starry) in a lymph node biopsy showing a conglomerate of black colored Barthonella bacillus (40X)

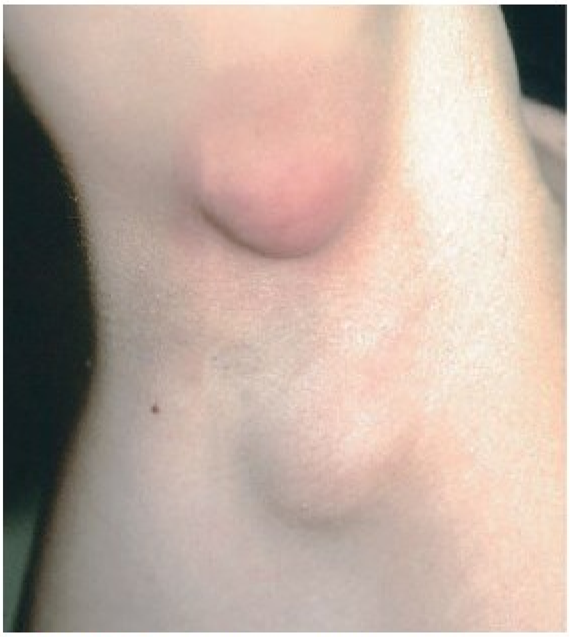


FIGURE 20–1 Cat-scratch disease. Note the two enlarged, inflamed axillary lymph nodes in a patient with cat-scratch disease. (Reproduced with permission from Wolff K, Johnson R. eds. *Fitzpatrick's Color Atlas & Synopsis of Clinical Dermatology*. 6th ed. New York, NY: McGraw-Hill; 2009.)

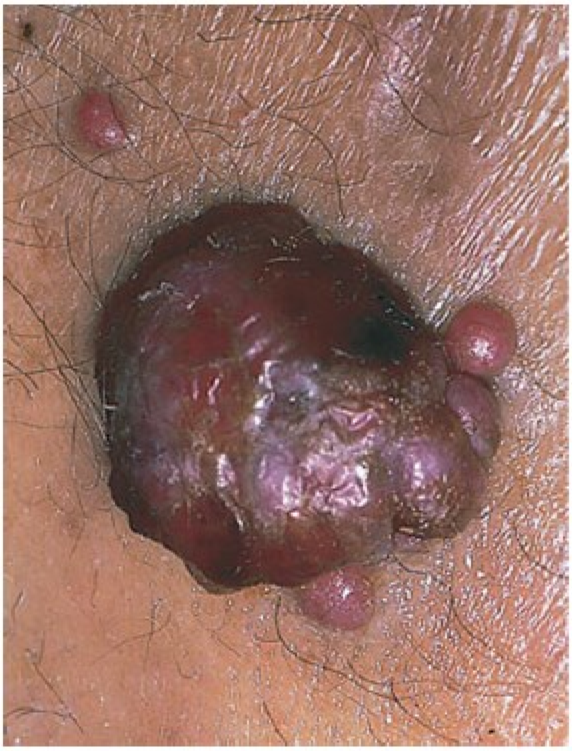


FIGURE 20–2 Bacillary angiomatosis. Note the cherry-red hemangioma-like skin lesion. (Reproduced with permission from Wolff K, Johnson R. eds. *Fitzpatrick's Color Atlas & Synopsis of Clinical Dermatology*. 6th ed. New York, NY: McGraw-Hill; 2009.)

643. An 18 years old male was brought to OPD with H/O of abnormal behavior and cognitive dysfunction for last 3 months increasing progressively. It was associated with myoclonus and loss of autonomic function. There is no history of trauma or recent travelling. He was diagnosed as a case of Subacute Sclerosing Panencephalitis (SSPE). Apart from history and clinical presentation which of the following investigation is not helpful for diagnosis:-

a) CSF IgG
b) Serum IgG
c) Serum IgM
d) EEG
e) CT scan brain

Key c

Serum IgM is typically not helpful in SSPE because it is a marker of acute or recent infection. SSPE, however, occurs years after the initial measles infection, and IgM would not typically be elevated at this stage.

644. A 16 year old boy presents with bloody diarrhoea. He gives history of having unpasteurized milk. The organism's motility can be seen in brucella tripticase soy broth. On which medium, should the organism be inoculated.

a) CIN medium
b) MacConkey agar
c) Skirrows medium
d) TCBS medium
e) Sabourauds dextrose agar

Key c

Skirrow's medium contains polymyxin B, vancomycin, and trimethoprim, which selectively inhibit the growth of Gram-positive and other Gram-negative bacteria, promoting the isolation of *Campylobacter* species.

645. Regarding Clostridium difficile associated diarrhea, which one of the following statements is correct;

a) Occurs In all hospitalized patients
b) Is treated by broad spectrum cephalosporins
c) Is improved by giving Proton pump inhibitors
d) Is never community acquired
e) Is always fatal

Key d

(D is wrong but prefer it over rest)

646. A 7 year old boy is recovering from impetigo. Physical examination shows five honey-colored crusts on his face.The crusts are removed, and a culture of the lesions grows streptococcus pyogenes. He is treated with antibiotics. One week later, he develops malaise with nausea and a slight fever and passes dark brown urine. Laboratory studies show a serum anti streptolysin O titer of 1:1024. Which of the following is the most likely outcome of his renal disease?

a) Chronic renal failure
b) Complete recovery
c) Crescentic glomerulonephritis
d) Rheumatic heart disease
e) Reiter's syndrome

Key b

Most children with PSGN recover completely, with appropriate treatment (such as antibiotics for the initial infection and supportive care for the renal issues). Chronic renal failure is rare in children.

In PSGN, the glomerulonephritis is usually non-crescentic and characterized by immune complex deposition in the glomeruli (type III hypersensitivity reaction), which leads to inflammation and damage. The histopathology typically shows diffuse proliferative glomerulonephritis

Crescentic glomerulonephritis (also known as rapidly progressive glomerulonephritis) is typically associated with anti-glomerular basement membrane (GBM) disease, Goodpasture syndrome, or vasculitis, and is characterized by the formation of crescent-shaped lesions in the glomeruli.

647. Regarding carbapenemases;

a) They are bacterial enzymes that degrade penicillins, cephalosporins and macrolides.
b) They are present in periplasmic space of most Gram positive and negative bacteria.
c) Doripenem is an option against these enzymes.
d) Antibiotic susceptibility testing for a carbapenemase producing isolate should include additional drugs like ceftazidime-avibactam, meropenem-vaborbactam, colistin, aztreonam, tigecycline and Fosfomycin.
e) The only option against these is colistin

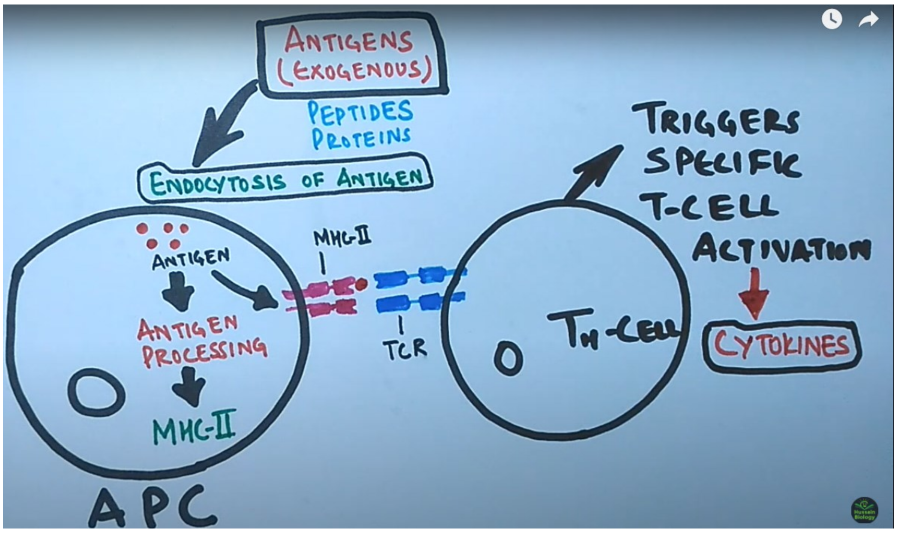
Key d

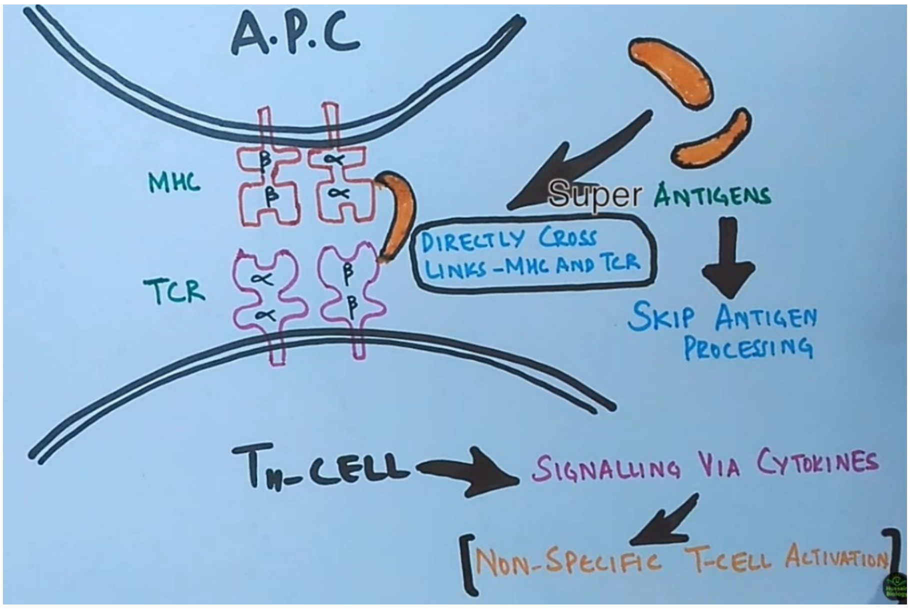
648. A family went for outing and had dinner at a local restaurant. Around three hours later, 3 members started experiencing vomiting alongwith crampy abdominal pains. The most likely mechanism of action of the expected organism is:

a) Shiga like toxin that enters the intestinal epithelial cells.
b) Inflammation of the intestinal mucosa.
c) Pathogenesis not well understood.
d) Preformed enterotoxin that acts like a superantigen.
e) Locking of Gs protein in the "on" position

Key d

The symptoms described — vomiting, crampy abdominal pains, and the onset occurring 3 hours after eating — are consistent with food poisoning caused by Staphylococcus aureus. This bacterium produces a preformed enterotoxin that acts as a superantigen, leading to rapid onset of symptoms within a few hours of ingestion.


ANTIGENS (EXOGENOUS)
PEPTIDES
PROTEINS
ENDOCYTOSIS OF ANTIGEN
ANTIGEN
ANTIGEN PROCESSING
MHC-II
MHC-II
TCR
TH-CELL
TRIGGERS SPECIFIC T-CELL ACTIVATION
CYTOKINES
APC


A.P.C
MHC
β
β
α
α
TCR
α
α
β
β
Super ANTIGENS
DIRECTLY CROSS LINKS -MHC AND TCR
SKIP ANTIGEN PROCESSING
TH-CELL
SIGNALLING VIA CYTOKINES
[NON-SPECIFIC T-CELL ACTIVATION]

Superantigens are a class of antigens that result in excessive activation of the immune system. Unlike conventional antigens, which are processed by antigen-presenting cells (APCs) and recognized by specific T-cells, superantigens directly bind to major histocompatibility complex (MHC) class II molecules and T-cell receptors (TCRs), triggering a massive release of cytokines.

A superantigen is a type of toxin that overstimulates the immune system. Normally, when the body encounters an infection, immune cells called T-cells recognize and attack specific threats. A superantigen, however, bypasses the normal control and stimulates many T-cells at once, regardless of whether they are needed to fight the infection.

649. A young boy, case of ALL, admitted at bone marrow transplant centre for past 2 weeks, developed line related septicemia. Blood culture revealed non-lactose fermenter colonies, oxidase positive, highly resistant organism. The most suitable regimen for him would be:

a) IV ceftriaxone along with amikacin.
b) IV meropenem along with oral co-trimoxazole.
c) IV colistin.
d) IV colistin and meropenem.
e) IV cefepime and tigecycline

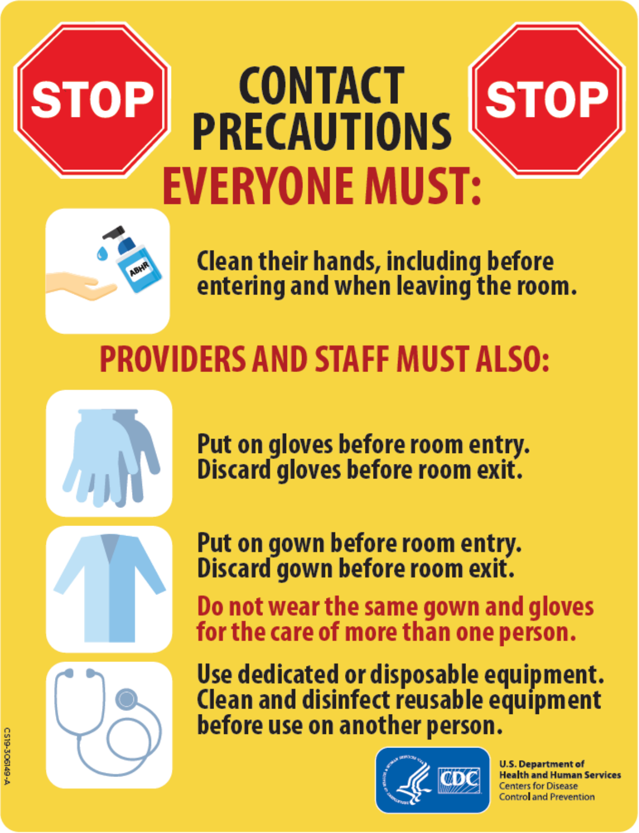
Key d

Combining colistin and meropenem provides synergistic coverage against highly resistant Gram-negative pathogens, especially in immunocompromised patients, like those undergoing bone marrow transplantation.

650. Prevention of most of the hospital acquired infections requires

a) Airborne precautions
b) Contact based precautions
c) Droplet precautions
d) Judicious use of antibiotics
e) Extensive cleaning/disinfection of patient care equipment

Key b



STOP
STOP
ABHR

CONTACT PRECAUTIONS

EVERYONE MUST:

Clean their hands, including before entering and when leaving the room.

PROVIDERS AND STAFF MUST ALSO:

Put on gloves before room entry.
Discard gloves before room exit.

Put on gown before room entry.
Discard gown before room exit.

Do not wear the same gown and gloves for the care of more than one person.

Use dedicated or disposable equipment.
Clean and disinfect reusable equipment before use on another person.

CDC
U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

CS19-306149-A

651. The treatment options available for VRE include

a) Cefepime
b) Ceftaroline
c) Ampicillin
d) Linezolid
e) Colistin in combination with ceftriaxone

Key d

652. The single most important measure for infection control is:

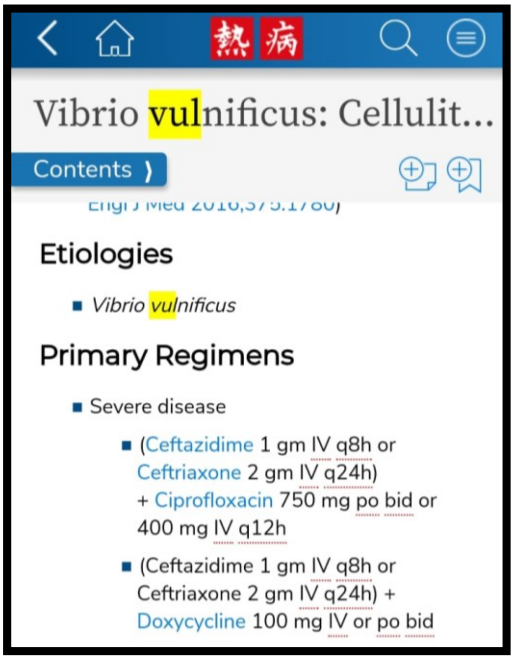
a) Wearing gloves
b) Using mask and gown
c) Using hand sanitizers
d) Observing contact-based precautions
e) Hand washing

Key e

653. A fisherman suffered a minor injury to right thumb that he noticed on coming back home from seashore, while he was fishing. A day later, he developed cellulitis of the hand which was progressing rapidly and a day later, he developed sepsis. The most suitable antibiotics for him would be:

a) Doxycycline or minocycline
b) Doxycycline or minocycline plus ceftriaxone or ceftazidime
c) Meropenem and colistin
d) Doxycycline and colistin
e) Azithromycin plus vancomycin

Key b



Vibrio vulnificus: Cellulit...

Engl J Med 2016;375:1780)

Etiologies

- *Vibrio vulnificus*

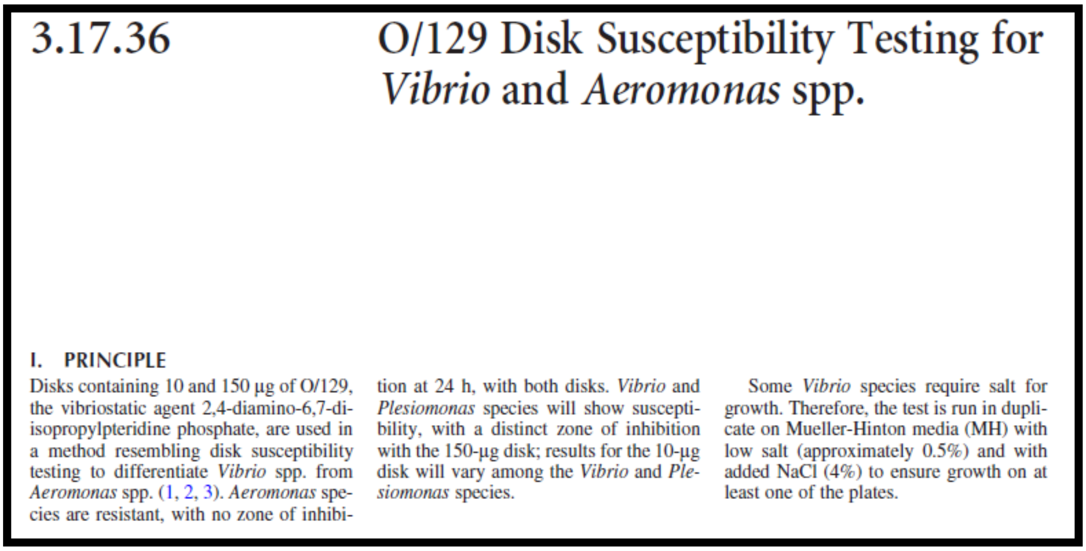
Primary Regimens

- Severe disease
  - (Ceftazidime 1 gm IV q8h or Ceftriaxone 2 gm IV q24h) + Ciprofloxacin 750 mg po bid or 400 mg IV q12h
  - (Ceftazidime 1 gm IV q8h or Ceftriaxone 2 gm IV q24h) + Doxycycline 100 mg IV or po bid

654. Regarding Aeromonas spp, which of the following statements can best describe characters of organism:

a) Catalase and oxidase positive
b) Catalase positive, oxidase negative
c) Catalase positive, oxidase positive, resistant to 0-129
d) Catalase positive, oxidase positive, motile, resistant to 0-129
e) Catalase positive, oxidase positive, motile, sensitive to 0-129

Key d



3.17.36

O/129 Disk Susceptibility Testing for *Vibrio* and *Aeromonas* spp.

I. PRINCIPLE

Disks containing 10 and 150 µg of O/129, the vibriostatic agent 2,4-diamino-6,7-diisopropylpteridine phosphate, are used in a method resembling disk susceptibility testing to differentiate *Vibrio* spp. from *Aeromonas* spp. (1, 2, 3). *Aeromonas* species are resistant, with no zone of inhibition at 24 h, with both disks. *Vibrio* and *Plesiomonas* species will show susceptibility, with a distinct zone of inhibition with the 150-µg disk; results for the 10-µg disk will vary among the *Vibrio* and *Plesiomonas* species.

Some *Vibrio* species require salt for growth. Therefore, the test is run in duplicate on Mueller-Hinton media (MH) with low salt (approximately 0.5%) and with added NaCl (4%) to ensure growth on at least one of the plates.

655. Vibrio cholerae is worldwide in distribution and continues to expand as water sources become polluted. Which of the following best describes this organism?

a) Reservoir in birds and mammals, optimal growthat 42oC
b) Halophilic, lactose-negative, sucrose negative; causes gastrointestinal diseases primarily from ingestion of under-cooked seafood
c) Halophilic , lactose fermenter, produces heat-labile, extracellular toxin, causes wound infection
d) Organisms susceptible to acid; not an invasive organism
e) Urease-positive; cause of fetal distress in cattle.

Key d

656. A 45 year old Japanese man comes to the OPD with complaints of abdominal discomfort, weight loss and heart burn. He also had a few episodes of hematemesis. Endoscopy is performed and biopsy reveals him to be having CA Stomach. What is the most likely pathogen involved?

a) Campylobacter jejuni
b) Salmonella typhi
c) Giardia lamblia
d) Helicobacter pylori
e) Shistosoma japonicum

Key d

657. All the following high risk groups should be offered influenza vaccination before winter season except:

a) 65 years
b) Patients with h/o adverse reaction
c) Health care workers
d) Individuals with underlying pulmonary or cardiac diseases
e) Pregnant female

Key b

658. A 27 year old Chinese man comes to the OPD with a mass in the nose. He has complaints of recurrent episodes of epistaxis. Biopsy of the mass reveals it to be nasopharyngeal carcinoma. What is the most likely carcinogen involved?

a) Cytomegalovirus
b) Epstein bar virus
c) Human herpes virus 8
d) HIV
e) HTLV

Key b

659. A 38 year old woman comes to the gynae clinic for a routine examination. O/E, she is found to have multiple easily friable lesions on the cervix. She is a chronic smoker and also gives the history of having multiple sexual partners. What is the most likely carcinogen involved?

a) HIV
b) Herpes simplex type 2
c) HPV
d) Human herpes virus 8
e) HBV

Key c

660. A middle-aged man during screening before surgery was found to be positive for Hepatitis C. This was then confirmed on quantitative PCR. The most suitable approach should be:

a) To start treatment with pegylated interferons for a period of 6 months
b) To start treatment with interferon α2b thrice weekly for 6 months
c) To wait and see till patient develops signs of decompensated disease
d) To start treatment with oral sofosbuvir for 3 months, then go for a repeat PCR.
e) To get an upper GI endoscopy done

Key d

661. A 42 year old man experiences malaise and increasing icterus for 2 weeks. Physical examination shows jaundice, but there are no other significant findings. Serologic test results are positive for IgM anti-HAV and negative for anti-HCV, HBsAg, and IgM anti HBc. Which of the following outcomes is most likely to occur in this man?

a) Chronic active hepatitis

b) Complete recovery
c) Fulminant hepatitis
d) Hepatocellular carcinoma
e) Liver cirrhosis

Key b

662. Anarobes are predominant flora in intestines. Typically, infections caused by anaerobes are
a) Confined to the abdomen
b) Never seen in lung because of its excellent blood supply
c) Polymicrobial
d) Rapidly progressive
e) Only occur in crushing limb injuries

Key C = CORRECT POLYMICROBIAL

663. Which of following disease is best diagnosed by serology?
a) Q fever
b) Pulmonary tuberculosis
c) Gonorrhea
d) Actinomycosis
e) Enteric Fever
Key a

664. A 31 years old, sexually active lady visits a medical practitioner for advice/treatment as her sex partner is diagnosed with gonorrhea. She was asymptomatic. Her physical examination was normal. On pelvic examination a white vaginal discharge was noted. Wet mount preparation of vaginal discharge revealed a protozoon with characteristic jerky motility. Which one of the following actions will you recommend?
a) Reassurance and a course of metronidazole
b) Treat her for gonorrhea also
c) Prolonged treatment if both cyst and trophozoite seen
d) Metronidazole + ceftriaxone + screen for other STDs
e) Treat her partner only if symptomatic

Key d

665. When is serum specimen obtained for serum bactericidal and antimicrobial assays?
a) Trough:1 hour before dose; Peak:1 hour after IV dose
b) Trough:1 hour after dose; Peak:3 hours beforeIM dose
c) Trough: 30 minutes before dose; Peak: 60 minutes after IM dose
d) Trough: 30 minutes before dose; Peak:12 hours after IV dose
e) Trough: 1 hour before dose; Peak: 8 hours after oral dose

Key c

666. An elderly female, who works in a pre-school present at emergency department with 12 hour's history of "gastric flu" like symptoms (diarrhea, headache, fever, aching limbs, and malaise) as well as profuse vomiting. TLC is normal while hemoglobin and hematocrit are slightly raised. She was stabilized by antiemetic and 4 liters of fluid. Her blood culture and routine stool culture was negative and so was stool sample for Clostrium difficile. Responsible agent was identified by RT- PCR of feces. Most likely causative agent is:
a) Vibrio cholerae
b) Norovirus
c) Enterotoxigenic Escherichia coli
d) Cryptosporidium parvum
e) Rota Virus

Key b

667. A 23 yr old male presented with fever, cough for last 04 days. After X-ray chest, diagnosis of bronchopneumonia was made and patient was sent home on oral levofloxacin with a bronchodilator. What is the mechanism of action of levofloxacin.

a) Binds to 50s subunit of ribosome and inhibits protein synthesis
b) Act on plasma membrane and disrupt it.
c) Bind to DNA gyrase and inhibits DNA replication
d) Binds to 30s subunit of ribosome and inhibits protein synthesis
e) Bind to DNA dependent RNA polymerase and inhibits it

Key c

668. A forty year old man was hospitalized after a traffic accident and put on ventilator. He had sustained multiple, severe injuries to head, chest as well as inhalational burns injury to lungs. On 3rd hospital day he developed Ventilator Associated Pneumonia (VAP) and later on bacteremia & sepsis. Culture of BAL yielded growth of non-motile, non-fermenting oxidase negative Gram negative coccobacilli, which was extensively drug resistant. What is the most likely pathogen?

a) Burkhuldaria cepacia
b) Stenotrophomonas maltophila
c) Chrysobacterium spp
d) Acinetobacter baumanii
e) Flavobacterium meningosepticum

Key d

669. A 25 yr old patient of leukemia is undergoing pre transplant workup. His throat and nasal swabs were taken for detection of MRSA. Which of the following is responsible for the development drug resistance in this organism?

a) Beta-lactamase production
b) Altered PBP-2
c) ESBL Production
d) Metello=β-lactamase
e) Amp C gene

Key b

670. A 57 year old male, who had a previous bout with tuberculosis, now presents with pulmonary problems. Nodular lung lesions are seen on chest X-ray, and a CBC indicates neutropenia. Hyphal elements were observed directly in a sputum specimen. Which is the MOST likely diagnosis?

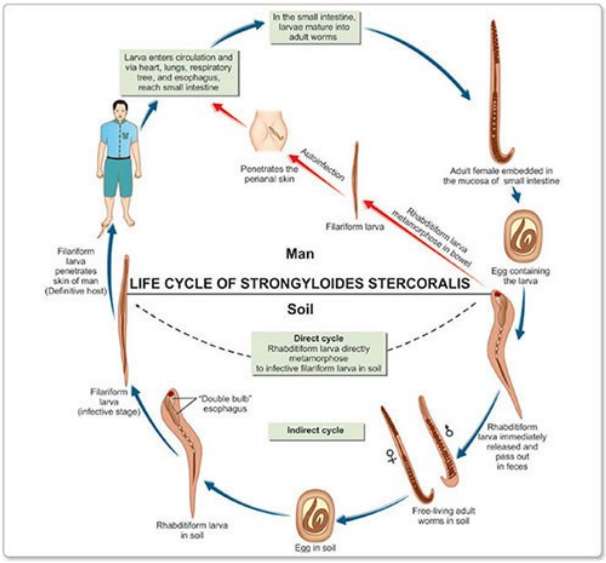
a) Histoplasmosis
b) Coccidoiodomycosis
c) Aspergillosis
d) Cryptococosis
e) Blastomucosis

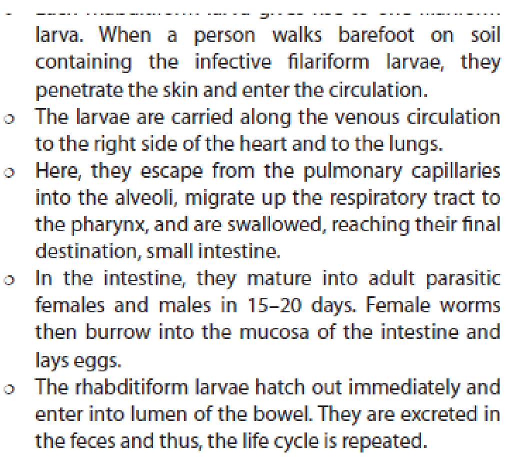
Key c

671. An 82 years old man with advanced COPD and metastatic adenocarcinoma of prostate was stable on steroids. He develops exacerbation of COPD and was hospitalized where he was treated with I/V antimicrobials and steroid dose increased. After discharge from hospital, he developed nausea, vomiting and cough with purulent sputum. Examination of sputum revealed larvae of a nematode. Which of the following is the causative agent?

a) Rhabdatiform larva of Strongolydes stercoralis
b) Rhabdatiform larva of Ascaris lumbricoides
c) Filariform larva of Strongolydes stercoralis
d) Visceral larva migrans
e) Wuchereria bancrofti filariasis

Key a (CONTROVERSIAL BUT CHOOSE C…evidence below)


In the small intestine, larvae mature into adult worms
Larva enters circulation and via heart, lungs, respiratory tree, and esophagus, reach small intestine
Penetrates the perianal skin
Autoinfection
Filariform larva
Rhabditiform larva metamorphose in bowel
Adult female embedded in the mucosa of small intestine
Egg containing the larva
Man
LIFE CYCLE OF STRONGYLOIDES STERCORALIS
Soil
Filariform larva penetrates skin of man (Definitive host)
Direct cycle
Rhabditiform larva directly metamorphose to infective filariform larva in soil
Filariform larva (infective stage)
"Double bulb" esophagus
Indirect cycle
♂
♀
Rhabditiform larva immediately released and pass out in feces
Free-living adult worms in soil
Rhabditiform larva in soil
Egg in soil



larva. When a person walks barefoot on soil containing the infective filariform larvae, they penetrate the skin and enter the circulation.

- The larvae are carried along the venous circulation to the right side of the heart and to the lungs.
- Here, they escape from the pulmonary capillaries into the alveoli, migrate up the respiratory tract to the pharynx, and are swallowed, reaching their final destination, small intestine.
- In the intestine, they mature into adult parasitic females and males in 15–20 days. Female worms then burrow into the mucosa of the intestine and lays eggs.
- The rhabditiform larvae hatch out immediately and enter into lumen of the bowel. They are excreted in the feces and thus, the life cycle is repeated.

672. Which of the following classes of antimicrobial agents pose the greatest toxicity risks and therefore are frequently monitored using antimicrobial assays?

a) Penicillins
b) Cephalosporins
c) Sulfonamides
d) Aminoglycosides
e) Tetracyclines

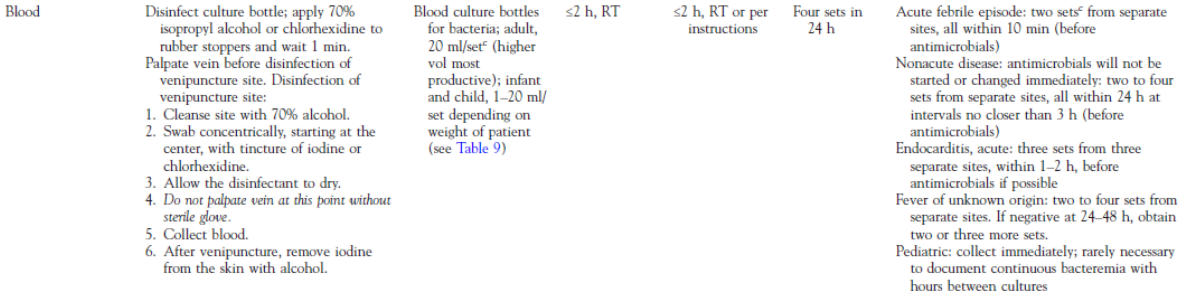
Key d

Aminoglycosides: These are known for their narrow therapeutic index matlab the effective dose is close to the toxic dose, with significant risks of nephrotoxicity and ototoxicity

673. A 34 yrs old IV drug user was brought to emergency with high grade fever, chills and dyspnoea for last 05 days. Also complaint of moderate chest pain off & on. On examination temp 103oF, JVP was raised, tricuspid murmur was audible. Further, pateciae on extremities and few splinter hemorrhages were also present. Clinical diagnosis of acute endocarditis was made. Clinician asks your advice for taking Blood samples for culture/sensitivity, what you would tell

a) 2 sets from different sites within 24 hrs
b) Single sample from central line
c) Single sample from peripheral line
d) 3 sets from different sites within 1-2 hrs
e) 3 sets from different sites within 24 hrs

Key d (TIMING CONFIRMED = D IS CORRECT)



Blood	Disinfect culture bottle; apply 70% isopropyl alcohol or chlorhexidine to rubber stoppers and wait 1 min. Palpate vein before disinfection of venipuncture site. Disinfection of venipuncture site: 1. Cleanse site with 70% alcohol. 2. Swab concentrically, starting at the center, with tincture of iodine or chlorhexidine. 3. Allow the disinfectant to dry. 4. *Do not palpate vein at this point without sterile glove.* 5. Collect blood. 6. After venipuncture, remove iodine from the skin with alcohol.	Blood culture bottles for bacteria; adult, 20 ml/set[c] (higher vol most productive); infant and child, 1–20 ml/set depending on weight of patient (see Table 9)	≤2 h, RT	≤2 h, RT or per instructions	Four sets in 24 h	Acute febrile episode: two sets[c] from separate sites, all within 10 min (before antimicrobials) Nonacute disease: antimicrobials will not be started or changed immediately: two to four sets from separate sites, all within 24 h at intervals no closer than 3 h (before antimicrobials) Endocarditis, acute: three sets from three separate sites, within 1–2 h, before antimicrobials if possible Fever of unknown origin: two to four sets from separate sites. If negative at 24–48 h, obtain two or three more sets. Pediatric: collect immediately; rarely necessary to document continuous bacteremia with hours between cultures

674. A 18 year old male student, who works part time in a shop which sells meat, fish & poultry, presents with diarrhea and abdominal cramps. He is afebrile with normal vitals. His blood counts are normal, examination of feces reveal watery stools with many white cells but no RBCs. Culture on specialized media yielded growth of curved gram negative rods, which were oxidase positive. What is the most likely pathogen?

a) Campylobacter jejuni
b) Vibrio cholera
c) Vibrio vulnificus
d) Campylobacter coli
e) Vibrio parahemolyticus

Key a

General say asool yaad rakhen:

☐ **Campylobacter jejuni: Commonly associated with handling/consuming contaminated poultry, meat, or fish, causing inflammatory diarrhea with leukocytes AND USUALLY BUT NOT ALWAYS RBCs also in stool. Jab specialized medium needed for growth ki baat hui tou Campy hi hai most likely as it has the most nakhray**

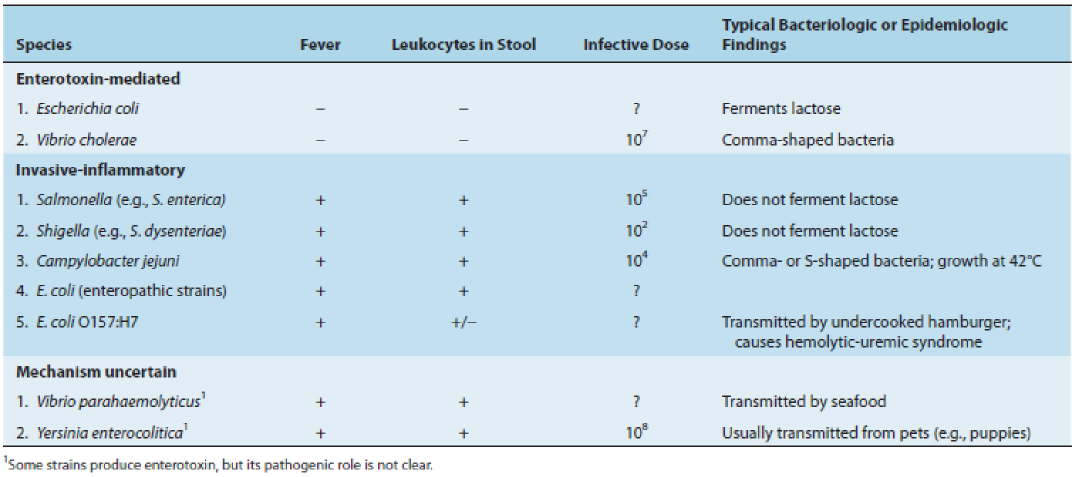
☐ **Campylobacter coli: Similar presentation but less common and typically linked to swine, making *C. jejuni* more likely here.**

☐ **Vibrio cholerae: Causes non-inflammatory diarrhea (no WBCs will be there) and usmen abdominal cramps wali baat zaada iski ni hoti, and profuse "rice-water" stools ka zikar hi nai, which doesn't match this case.**

☐ **Vibrio vulnificus: Primarily causes wound infections or septicemia, not diarrhea.**

☐ **Vibrio parahaemolyticus: Causes diarrhea often linked to RAW SEAFOOD ONLY, not handling poultry/meat, and is TYPICALLY BUT NOT ALWAYS non-inflammatory.**

TABLE 18–3 Gram-Negative Rods Causing Diarrhea



Species	Fever	Leukocytes in Stool	Infective Dose	Typical Bacteriologic or Epidemiologic Findings
Enterotoxin-mediated				
1. *Escherichia coli*	–	–	?	Ferments lactose
2. *Vibrio cholerae*	–	–	10^7	Comma-shaped bacteria
Invasive-inflammatory				
1. *Salmonella* (e.g., *S. enterica*)	+	+	10^5	Does not ferment lactose
2. *Shigella* (e.g., *S. dysenteriae*)	+	+	10^2	Does not ferment lactose
3. *Campylobacter jejuni*	+	+	10^4	Comma- or S-shaped bacteria; growth at 42°C
4. *E. coli* (enteropathic strains)	+	+	?	
5. *E. coli* O157:H7	+	+/–	?	Transmitted by undercooked hamburger; causes hemolytic-uremic syndrome
Mechanism uncertain				
1. *Vibrio parahaemolyticus*[1]	+	+	?	Transmitted by seafood
2. *Yersinia enterocolitica*[1]	+	+	10^8	Usually transmitted from pets (e.g., puppies)

[1] Some strains produce enterotoxin, but its pathogenic role is not clear.

675. A mother brings her 3 weeks old daughter to emergency department for worsening respiratory symptoms (episodes of cough, tachypnea, and tachycardia). During cough bouts her tachypnea increases to 90 breaths /minute and oxygen saturation falls to 80%. Cough bouts are followed by vomiting. Her TLC is raised with 70%

lymphocytes. Previously, the mother had a cough of 4 week duration but no fever. What is the likely pathogen?

a) Respiratory Syncytial Virus (RSV)
b) Bordetella pertussis
c) Hemophilus influenzae (non-typable)
d) Influenza virus
e) Mycoplasma pneumonia

Key b

Bordetella pertussis catch points = Unvaccinated child. LYMPHOCYTOSIS not leukocytosis! 100 day cough. Post tussive vomiting. Whooping sound on cough

676. Biochemical reactions are important for identification of bacteria. The following organisms are both indole positive

a) Yersinia pestis and Staphylococcus aureus
b) Aeromonas hydrophila and Vibrio cholera
c) Pasteurella multocida and Brucella abortus
d) Klebseilla pneumoniae and Vibrio vuinificus
e) Enterbobacter cloacae&Pseudomonas aeruginosa

Key b

Remember that PPM group is also indole positive except Proteus mirabilis!

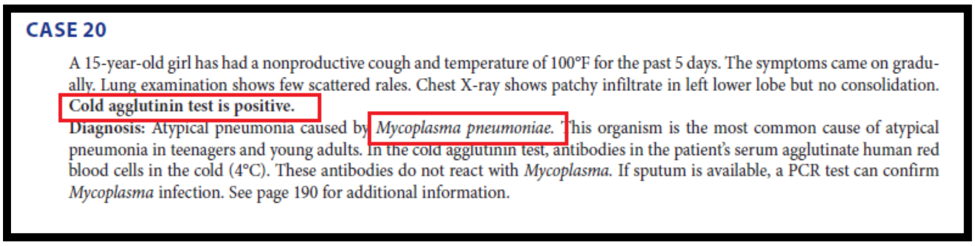
677. A 29-year-old male patient was admitted to the hospital with an eight-day history of fever and productive cough, followed by jaundice and passing dark urine for three days. The patient was previously healthy and was not using any drugs. There was no family history of hemolytic attacks. Initial investigations showed a hemoglobin level of 6.3 g/ dL, and TLC of 23,000/mm3 A peripheral blood film showed marked leucocytosis and agglutination. Chest X-ray showed bilateral basal opacities. Reticulocyte count was 4.5%. Other blood chemistry, liver profile, and coagulations studies were within normal limits. Malaria parasite smear was negative. Direct Coombs' test was strongly positive and cold agglutinin titer was high, with anti-I specificity. What is the most likely diagnosis in this patient?

a) Hemolytic uremic syndrome
b) Septicemia
c) Acute hemolysis due to Mycoplasma pneumonia
d) Malaria
e) Babesiosis

Key c
This patient's symptoms—fever, productive cough, jaundice, and dark urine—along with laboratory findings, strongly suggest hemolytic anemia secondary to *Mycoplasma pneumoniae* infection. The elevated cold agglutinin titer with anti-I specificity is characteristic of cold agglutinin disease, often associated with *Mycoplasma pneumoniae.*

"Anti-I specificity" refers to antibodies that target the "I" antigen on red blood cells. The I antigen is a carbohydrate structure present on the surface of red blood cells. Anti-I antibodies are typically cold-reactive IgM antibodies that agglutinate red blood cells at low temperatures (cold agglutinins). They are commonly associated with cold agglutinin disease (CAD) or conditions secondary to infections like Mycoplasma pneumoniae or certain viral infections.

Cold agglutinins are antibodies that cause red blood cells (RBCs) to clump together (agglutinate) when exposed to lower temperatures, typically around 4°C. These antibodies are typically IgM and are most commonly associated with certain infections. Their presence can be used as a diagnostic clue for various diseases, particularly Mycoplasma pneumoniae.



CASE 20

A 15-year-old girl has had a nonproductive cough and temperature of 100°F for the past 5 days. The symptoms came on gradually. Lung examination shows few scattered rales. Chest X-ray shows patchy infiltrate in left lower lobe but no consolidation. **Cold agglutinin test is positive.**

Diagnosis: Atypical pneumonia caused by *Mycoplasma pneumoniae.* This organism is the most common cause of atypical pneumonia in teenagers and young adults. In the cold agglutinin test, antibodies in the patient's serum agglutinate human red blood cells in the cold (4°C). These antibodies do not react with *Mycoplasma.* If sputum is available, a PCR test can confirm *Mycoplasma* infection. See page 190 for additional information.

678. A 13 year old boy, known case of sickle cell disease, presented with high grade fever and severe bone pains. Radiological investigations suggested osteomyelitis. Paired blood cultures were received in microbiology department which showed growth of Gram negative rods. They were oxidase negative. What is the most likely pathogen in this case?

a) Shigella
b) Staphylococcus
c) Salmonella
d) Yersinia
e) Stenotrophomonas

Key c

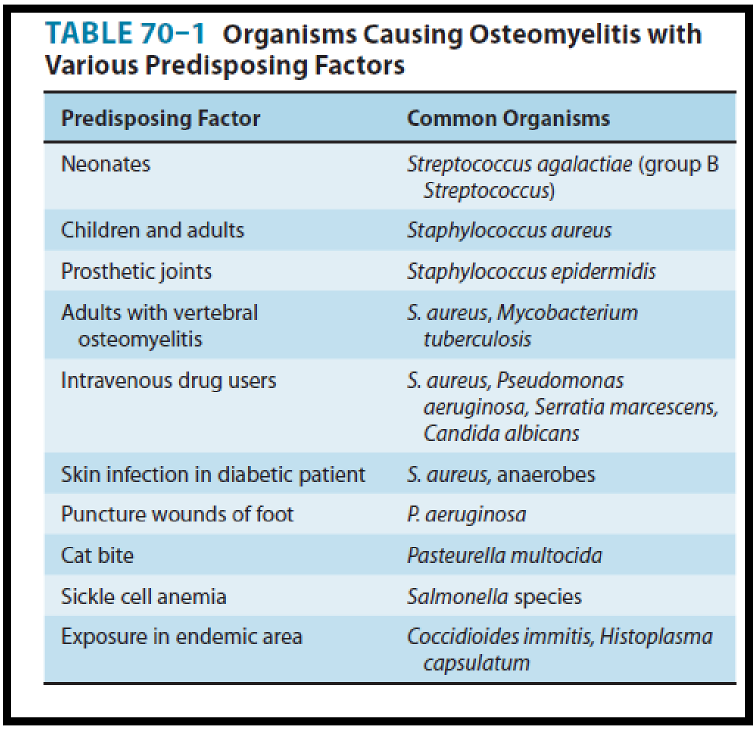


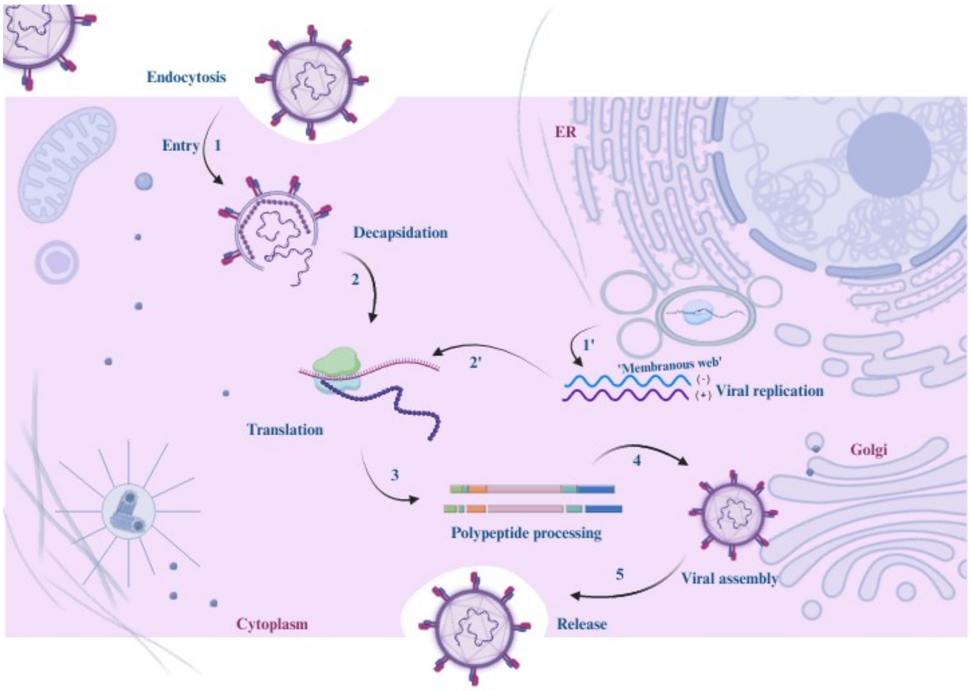
TABLE 70–1 Organisms Causing Osteomyelitis with Various Predisposing Factors

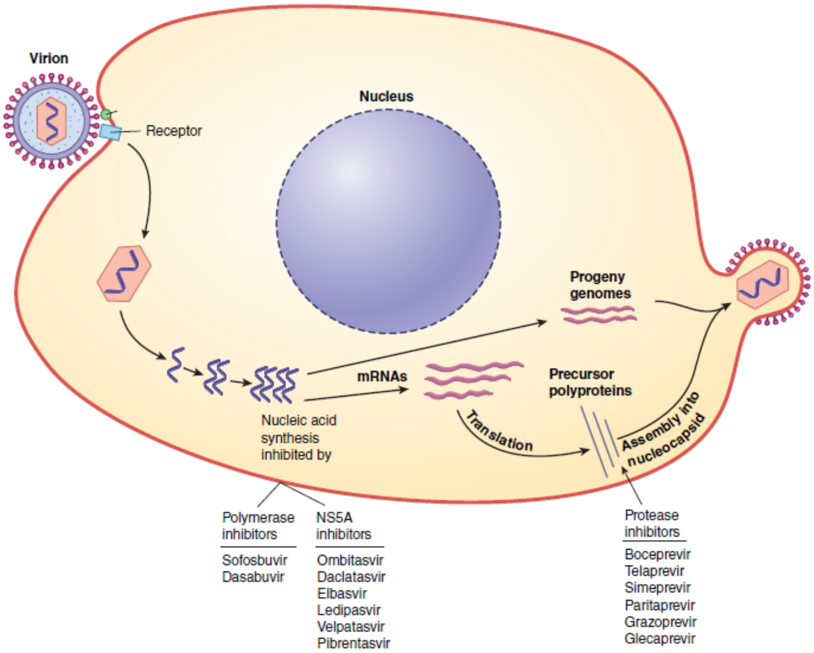
Predisposing Factor	Common Organisms
Neonates	*Streptococcus agalactiae* (group B *Streptococcus*)
Children and adults	*Staphylococcus aureus*
Prosthetic joints	*Staphylococcus epidermidis*
Adults with vertebral osteomyelitis	*S. aureus, Mycobacterium tuberculosis*
Intravenous drug users	*S. aureus, Pseudomonas aeruginosa, Serratia marcescens, Candida albicans*
Skin infection in diabetic patient	*S. aureus*, anaerobes
Puncture wounds of foot	*P. aeruginosa*
Cat bite	*Pasteurella multocida*
Sickle cell anemia	*Salmonella* species
Exposure in endemic area	*Coccidioides immitis, Histoplasma capsulatum*

679. 45 yrs old man presents with 8 months history of lethargy and early fatigability. His serum ALT level is mildly elevated. He was advised Hepatitis screening and was found positive for anti HCV antibodies by 4th generations ELISA. He was recommended treatment with oral direct acting anti-viral including sofosbruvir and ribovarin. Sofosbuvir acts by inhibiting.

a. Viral binding
b. Viral uncoating
c Viral budding
d. Viral Polymerase
e. Viral reverse transcriptase

Key d


Endocytosis
Entry 1
Decapsidation
2
ER
1'
'Membranous web'
(-)
(+)
Viral replication
2'
Translation
3
Polypeptide processing
4
Golgi
Viral assembly
5
Release
Cytoplasm


Virion
Receptor
Nucleus
Progeny genomes
mRNAs
Precursor polyproteins
Nucleic acid synthesis inhibited by
Translation
Assembly into nucleocapsid
Polymerase inhibitors
Sofosbuvir
Dasabuvir
NS5A inhibitors
Ombitasvir
Daclatasvir
Elbasvir
Ledipasvir
Velpatasvir
Pibrentasvir
Protease inhibitors
Boceprevir
Telaprevir
Simeprevir
Paritaprevir
Grazoprevir
Glecaprevir

GURE 41–5 Site of action of drugs used in treatment of chronic hepatitis C virus infection.

680. A suspected case of HBV comes to you for detailed laboratory evaluation. His reports showed:

HBsAg_______ HBeAg_________________ antiHBe____________________

+ve
+ve
-ve

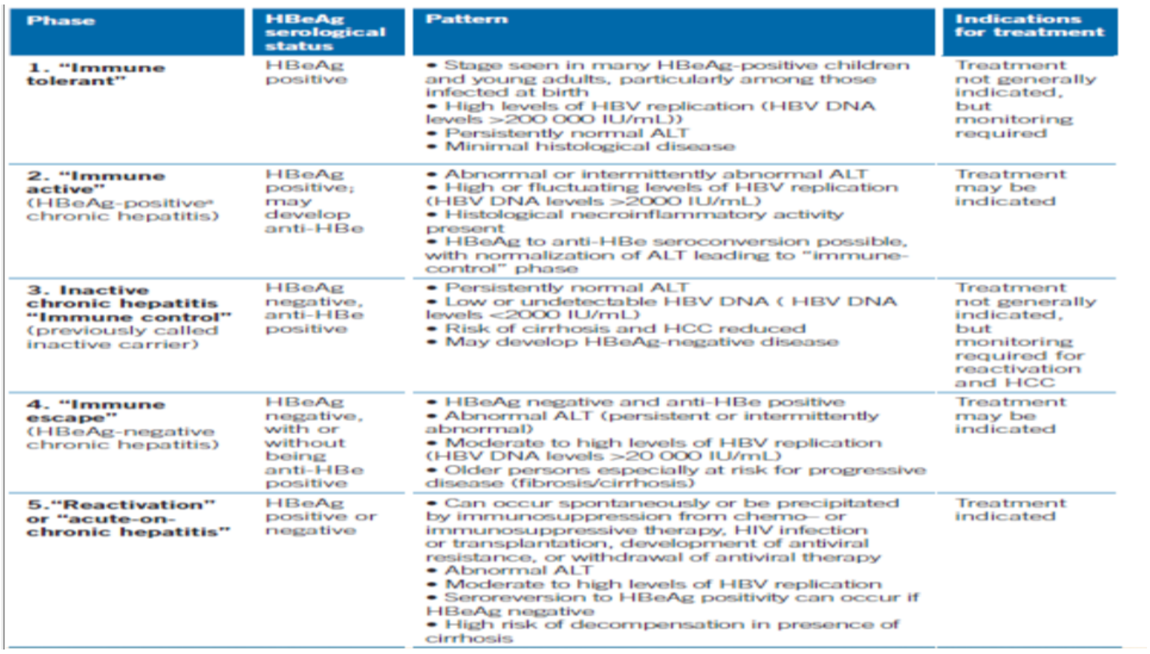
anti-HBc_______+ve
HBV DNR PCR: 978,077 IU/ml

Which phase of disease is evident from these reports?

a. Immune tolerant
b. Immune active
c. Immune control
d. Immune escape
e. Acute on chronic

Key a

ALT NORMAL HAI PATIENT KA!!



Phase	HBeAg serological status	Pattern	Indications for treatment
1. "Immune tolerant"	HBeAg positive	• Stage seen in many HBeAg-positive children and young adults, particularly among those infected at birth • High levels of HBV replication (HBV DNA levels >200 000 IU/mL)) • Persistently normal ALT • Minimal histological disease	Treatment not generally indicated, but monitoring required
2. "Immune active" (HBeAg-positive chronic hepatitis)	HBeAg positive; may develop anti-HBe	• Abnormal or intermittently abnormal ALT • High or fluctuating levels of HBV replication (HBV DNA levels >2000 IU/mL) • Histological necroinflammatory activity present • HBeAg to anti-HBe seroconversion possible, with normalization of ALT leading to "immune-control" phase	Treatment may be indicated
3. Inactive chronic hepatitis "Immune control" (previously called inactive carrier)	HBeAg negative, anti-HBe positive	• Persistently normal ALT • Low or undetectable HBV DNA (HBV DNA levels <2000 IU/mL) • Risk of cirrhosis and HCC reduced • May develop HBeAg-negative disease	Treatment not generally indicated, but monitoring required for reactivation and HCC
4. "Immune escape" (HBeAg-negative chronic hepatitis)	HBeAg negative, with or without being anti-HBe positive	• HBeAg negative and anti-HBe positive • Abnormal ALT (persistent or intermittently abnormal) • Moderate to high levels of HBV replication (HBV DNA levels >20 000 IU/mL) • Older persons especially at risk for progressive disease (fibrosis/cirrhosis)	Treatment may be indicated
5."Reactivation" or "acute-on-chronic hepatitis"	HBeAg positive or negative	• Can occur spontaneously or be precipitated by immunosuppression from chemo– or immunosuppressive therapy, HIV infection or transplantation, development of antiviral resistance, or withdrawal of antiviral therapy • Abnormal ALT • Moderate to high levels of HBV replication • Seroreversion to HBeAg positivity can occur if HBeAg negative • High risk of decompensation in presence of cirrhosis	Treatment indicated

681. A 27 yrs old male homosexual presented with five month history of intractable diarrhea, fever, lethargy and weight loss. He has taken multiple antibiotic courses but condition remained unchanged. Laboratory evaluation showed that he is 'positive' for anti-HIV-1 antibodies by fourth generation ELISA . According to latest guidelines, which of the following tests is recommended for "confirmation" of initial HIV positive test results.

a. CD 4 count
b. HIV-1 RNA PCR
c. Line Immunoassay (LIA)
d. Anti-HIV by Chemiluminiscence method
e. PP 65 antigenemia

Key b (Prefer Immunoblot to PCR)

682. Most Appropriate Test for Early Detection of Mycobacterium Tuberculosis (MTB) and Its Susceptibility

a) GeneXpert
b) Line Probe Assay
c) QuantiFERON TB Gold
d) Growth on LJ Medium
e) MGIT for Growth

Key: a) GeneXpert

683. Follow-Up Test for a Patient on Tuberculosis Treatment for 1 Month

a) Acid Fast Staining
b) Line Probe Assay
c) QuantiFERON TB Gold
d) GeneXpert
e) Culture

Key: CORRECTED = ACID FAST STAINING TO SEE IF SMEAR NEGATIVE

Smear-negative tuberculosis (TB) is a type of tuberculosis that's diagnosed when a patient has at least two sputum (?) samples that are negative for acid-fast bacilli (AFB) on different occasions

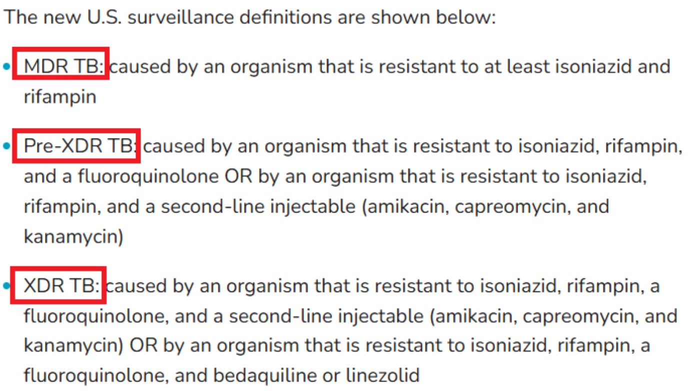
684. Test Which Can Rapidly Identify Tuberculosis Resistance

a) GeneXpert
b) MALDI-TOF
c) Line Probe Assay
d) Mycobacterial Growth Indicator Tube
e) QuantiFERON TB Gold

Key: CORRECTED = A (LPA TAKES LONGER THAN GENEXPERT)

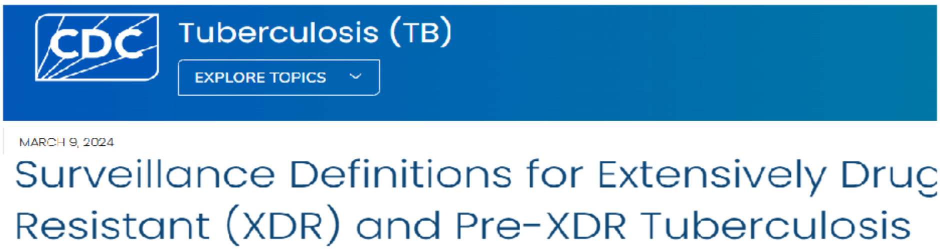
685. Resistance Category for an Isolate Resistant to Isoniazid, Rifampicin, Streptomycin, and Sensitive to Pyrazinamide, Ethambutol

a) Extensively Drug-Resistant
b) Mono-Resistant
c) Multidrug-Resistant
d) Pre-Extensively Drug-Resistant
e) Totally Drug-Resistant
Key: c) Multidrug-Resistant



The new U.S. surveillance definitions are shown below:

- MDR TB: caused by an organism that is resistant to at least isoniazid and rifampin
- Pre-XDR TB: caused by an organism that is resistant to isoniazid, rifampin, and a fluoroquinolone OR by an organism that is resistant to isoniazid, rifampin, and a second-line injectable (amikacin, capreomycin, and kanamycin)
- XDR TB: caused by an organism that is resistant to isoniazid, rifampin, a fluoroquinolone, and a second-line injectable (amikacin, capreomycin, and kanamycin) OR by an organism that is resistant to isoniazid, rifampin, a fluoroquinolone, and bedaquiline or linezolid



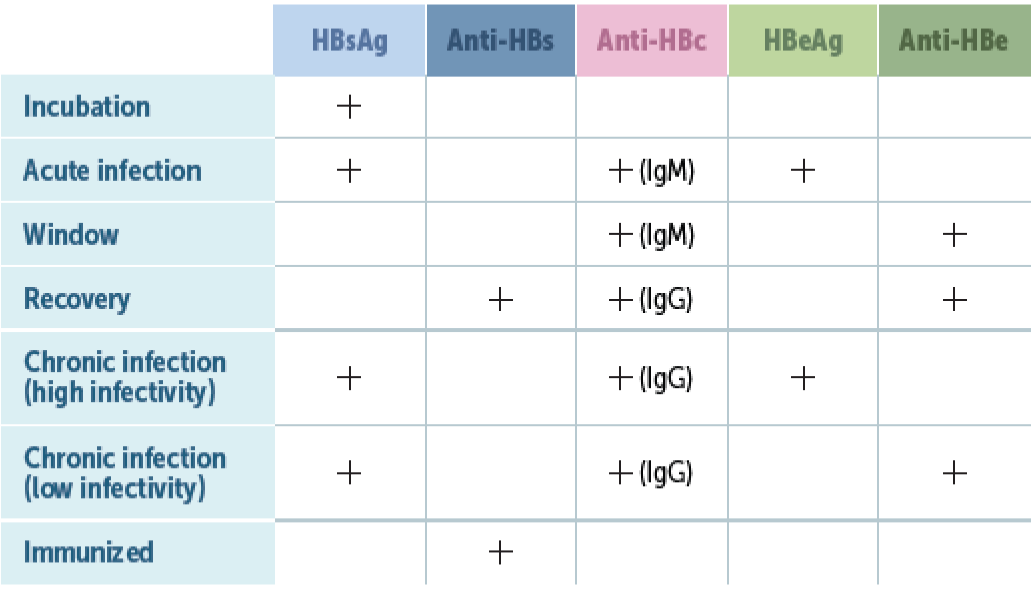
MARCH 9, 2024

Surveillance Definitions for Extensively Drug Resistant (XDR) and Pre-XDR Tuberculosis

686. Interpretation of Hepatitis B Serological Markers

HbsAg: Negative
Anti-HBc (Total): Positive
Anti-HBc IgM: Negative
Anti-HBs: Positive

a) Active Infection
b) Chronic Carrier
c) Need of Vaccination
d) Past Immunization
e) Past Infection and Immunization
Key: e) Past Infection and Immunization



	HBsAg	Anti-HBs	Anti-HBc	HBeAg	Anti-HBe
Incubation	+				
Acute infection	+		+ (IgM)	+	
Window			+ (IgM)		+
Recovery		+	+ (IgG)		+
Chronic infection (high infectivity)	+		+ (IgG)	+	
Chronic infection (low infectivity)	+		+ (IgG)		+
Immunized		+			

687. Patient with Community Acquired Pneumonia, X-ray shows bilateral infiltrates.Rx?

a) Ceftriaxone
b) Ciprofloxacin
c) Clarithromycin
d) Cloxacillin
e) COT

Key: a) Ceftriaxone

In the case of community-acquired pneumonia (CAP), especially with bilateral infiltrates seen on chest X-ray, broad-spectrum antibiotic therapy is often required to cover the most common pathogens, which include *Streptococcus pneumoniae*, *Haemophilus influenzae etc*

688. Patient in NICU, Culture Yielded GNR +ve, Resistant to Many Antibiotics, Sensitive to Vanc

a) Acinetobacter
b) Chryseobacterium meningosepticum
c) Burkholderia
d) Stenotrophomonas
e) Pseudomonas

Key: CORRECTED = B (CHRYSEROBACTERIUM AND ELIZABETHKINGIA ARE SENSITIVE TO VANC)

FOR MICRO PPL ONLY: Enlist gram negative rods which are vancomycin sensitive but colistin resistant?
Sphingomonas
Empidobacter
Chryseobacterium
Elizabethkingia

689. History of Visit to New York, Presented with Rash on Leg, Red and Expanding, Arthropod Borne Infection Suspected

a) Borrelia burgdorferi
b) Borrelia recurrentis
c) Leishmania mexicana
d) Mycobacterium leprae
e) Streptococcus pyogenes

Key: a) Borrelia burgdorferi (no hx of relapsing fever so no recurrentis)

690. Sexually Active Man, Rash on Palms and Soles, Fever, Headache, Myalgia, Lymphadenopathy, No Growth on Blood Culture and Skin Lesions Culture

a) Brucella melitensis
b) Leptospira interrogans
c) HSV
d) Rickettsia rickettsii

e) Treponema pallidum
Key: e) Treponema pallidum

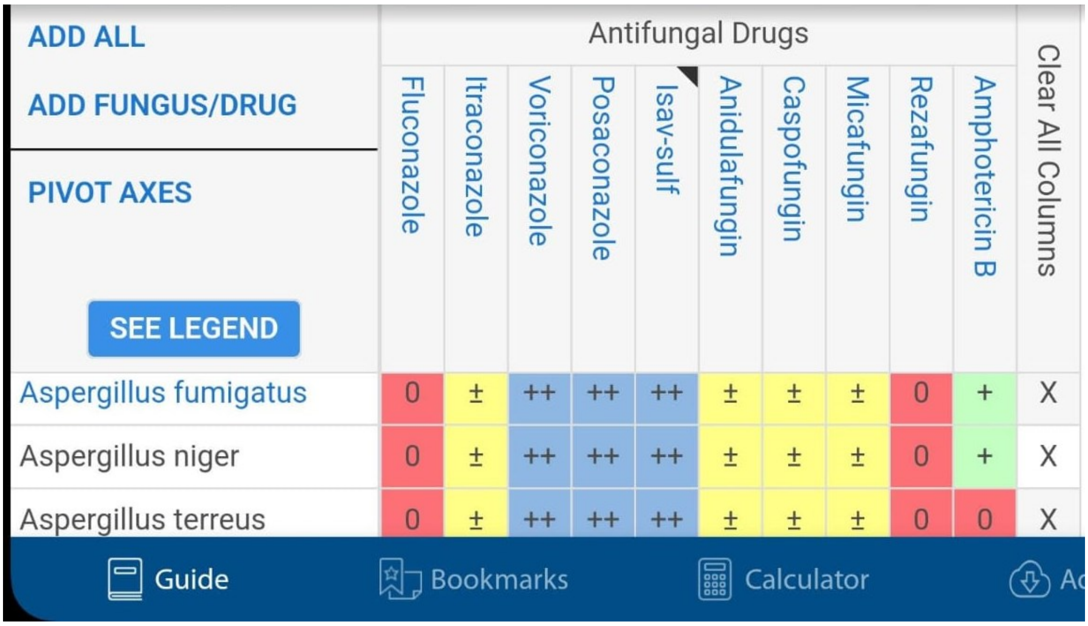
691. Cystic Fibrosis, Bacteria Having Strong Association with Sharp Decline in FEV1 in CF
a) Pseudomonas
b) Mycobacterium tuberculosis
c) Burkholderia
d) Mycobacterium avium complex
e) Mycobacterium abscessus
Key: a) Pseudomonas

692. Patient Operated for Growth in Intestine, Put on Vent and Develops Ventilator-Associated Pneumonia (VAP) After 48 Hours, Acinetobacter Identified in Growth
Rx?
a) Imipenem
b) Cefoperazone
c) Ciprofloxacin
d) Doxycycline
e) Amikacin
Key: a) Imipenem (not a good quality mcq)

693. Patient Undergone Abdominal Surgery, MRSA Identified After 7 Days of Surgery
Rx? a) Ampicillin
b) Co-amoxiclav
c) Ceftaroline
d) Cloxacillin
e) Penicillin
Key: c) Ceftaroline

694. Histoplasma capsulatum Treatment a) Anidulafungin + Prednisolone for 6 weeks
b) Caspofungin + Prednisolone for 6 weeks
c) Amphotericin + Prednisolone for 2 weeks
d) Itraconazole + Prednisolone for 6 weeks
e) Voriconazole + Prednisolone for 5 weeks
Key: d) Itraconazole + Prednisolone for 6 week

695. Antifungal Resistant to Aspergillus
a) Caspofungin
b) Fluconazole
c) Itraconazole
d) Posaconazole
e) Voriconazole
Key: b) Fluconazole



	Antifungal Drugs										
	Fluconazole	Itraconazole	Voriconazole	Posaconazole	Isav-sulf	Anidulafungin	Caspofungin	Micafungin	Rezafungin	Amphotericin B	Clear All Columns
Aspergillus fumigatus	0	±	++	++	++	±	±	±	0	+	X
Aspergillus niger	0	±	++	++	++	±	±	±	0	+	X
Aspergillus terreus	0	±	++	++	++	±	±	±	0	0	X

696. Diabetic Ketoacidosis, Headache, Nasal Congestion, Drowsiness, Unconsciousness, Black Necrotic Lesion on Nasal Septum with Perforation, CSF Normal, Culture Grows Streptococcus pneumoniae and Staphylococcus aureus

Diagnose?
a) Dental abscess
b) Nasal diphtheria
c) Orbital cellulitis
d) Rhinocerebral mucormycosis
e) Severe maxillary sinusitis
Key: d) Rhinocerebral mucormycosis

697. Nappy Rash in a Kid, Green Colonies on Chrome, White Lesions in Mouth
a) Candida albicans
b) Candida parapsilosis
c) Candida glabrata
d) Candida krusei
e) Candida tropicalis
Key: a) Candida albicans

698. Plasmodium Frequently Causing Serious Disease
a) P. knowlesi
b) P. malariae
c) P. ovale
d) P. silvaticum
e) P. vivax
Key: a) P. knowlesi

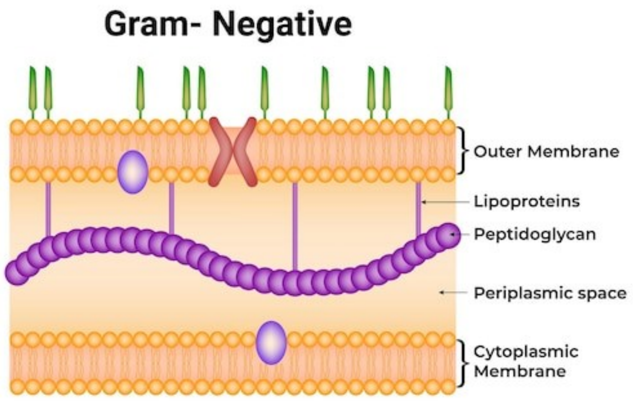
699. Pregnant Woman Traveling to Malaria Endemic Area, Prophylaxis? (M say Mother , M say Mefloquine – Dr. Safa)

700. Biological Safety Cabinet (BSC) to be Certified At
a) Monthly
b) Quarterly
c) Laminar flow test
d) UV lamp clean
e) Moved to another place
Key: b) Quarterly

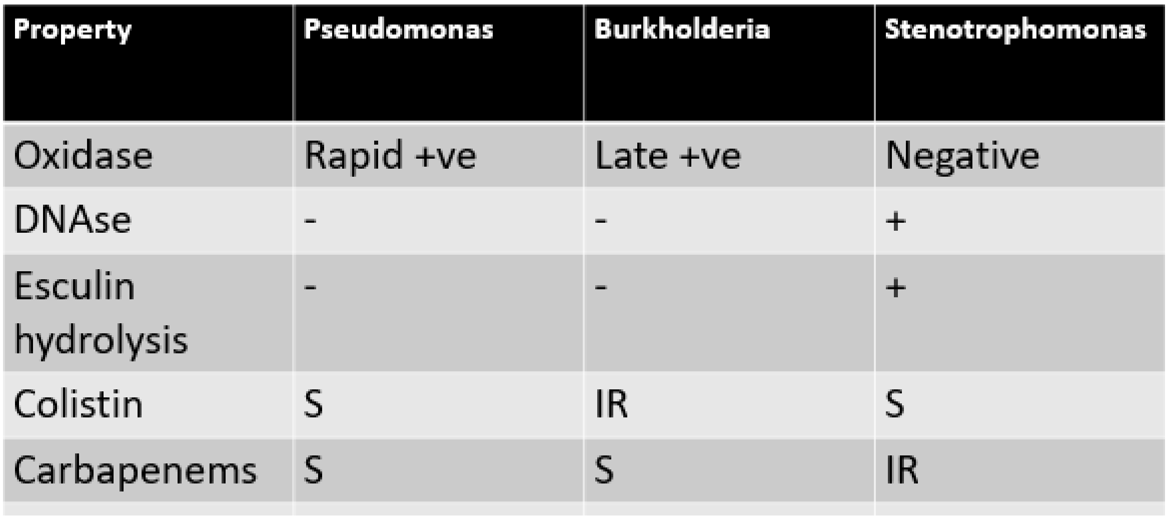
700. Biological Safety Cabinet (BSC) to be Certified At
a) Monthly
b) Quarterly
c) Laminar flow test
d) UV lamp clean
e) Moved to another place
Key: b) Quarterly

This certification includes testing airflow patterns, HEPA filter integrity, and ensuring that the cabinet provides adequate protection for both the user and the environment.

701. Peptidoglycan Location
a) Outside cell membrane
b) Periplasmic space
c) Outside capsule
Key: b) Periplasmic space


Gram- Negative
Outer Membrane
Lipoproteins
Peptidoglycan
Periplasmic space
Cytoplasmic Membrane

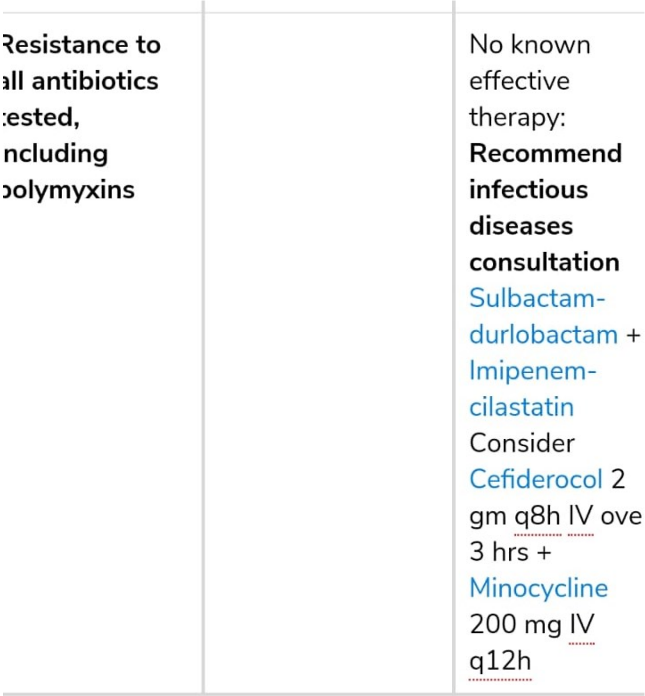
702. Late Oxidase Positive, Colistin Resistant, COT Sensitive, Organism Found in Antiseptic Solution
a) Burkholderia
b) Proteus
c) Providencia
d) Serratia
e) Acinetobacter
Key: a) Burkholderia



Property	Pseudomonas	Burkholderia	Stenotrophomonas
Oxidase	Rapid +ve	Late +ve	Negative
DNAse	-	-	+
Esculin hydrolysis	-	-	+
Colistin	S	IR	S
Carbapenems	S	S	IR

703. Acinetobacter Resistant to Colistin, Carbapenems, Amikacin? Rx
a) Cefiderocol
b) Ceftaroline
c) Ceftobiprole

Key: a) Cefiderocol



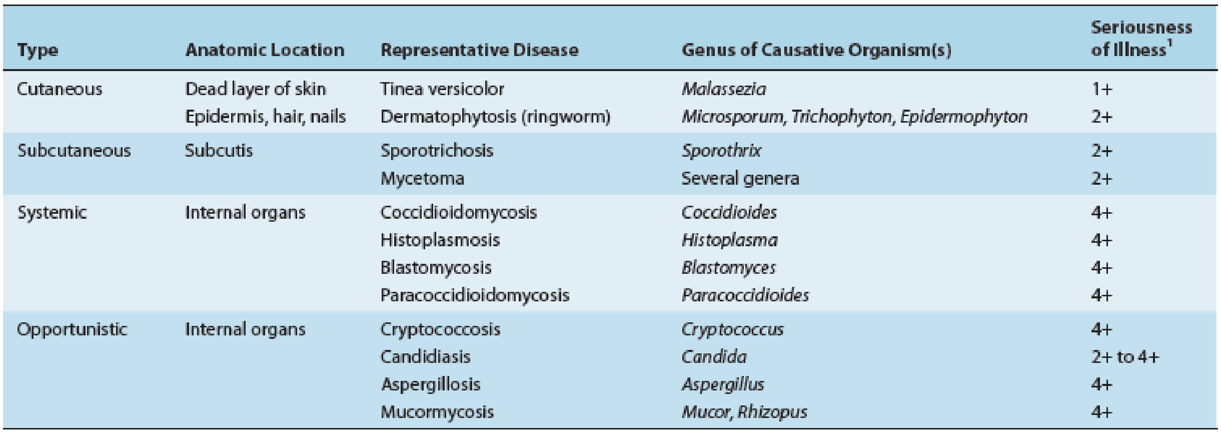
Resistance to ll antibiotics ested, ncluding olymyxins		No known effective therapy: **Recommend infectious diseases consultation** Sulbactam-durlobactam + Imipenem-cilastatin Consider Cefiderocol 2 gm q8h IV ove 3 hrs + Minocycline 200 mg IV q12h

704. Patchy Alopecia, Microscopy of Hair Show Arthroconidia as Mosaic Sheath Around Hair, Green Fluorescence on Wood Lamp

a) Epidermophyton floccosum
b) Microsporum audouinii
c) Microsporum gypseum
d) Trichophyton schoenleinii
e) Trichophyton tonsurans

Key: CORRECTED = MICROSPORUM AUDOUINII

TABLE 48–1 **Features of Important Fungal Diseases**



Type	Anatomic Location	Representative Disease	Genus of Causative Organism(s)	Seriousness of Illness[1]
Cutaneous	Dead layer of skin	Tinea versicolor	*Malassezia*	1+
	Epidermis, hair, nails	Dermatophytosis (ringworm)	*Microsporum, Trichophyton, Epidermophyton*	2+
Subcutaneous	Subcutis	Sporotrichosis	*Sporothrix*	2+
		Mycetoma	Several genera	2+
Systemic	Internal organs	Coccidioidomycosis	*Coccidioides*	4+
		Histoplasmosis	*Histoplasma*	4+
		Blastomycosis	*Blastomyces*	4+
		Paracoccidioidomycosis	*Paracoccidioides*	4+
Opportunistic	Internal organs	Cryptococcosis	*Cryptococcus*	4+
		Candidiasis	*Candida*	2+ to 4+
		Aspergillosis	*Aspergillus*	4+
		Mucormycosis	*Mucor, Rhizopus*	4+

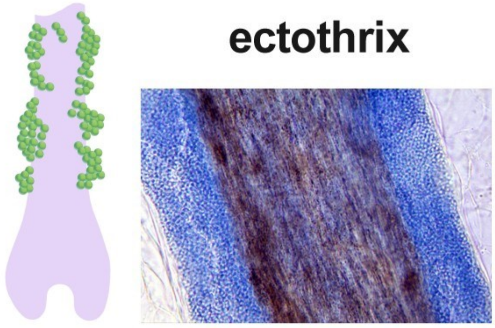
[1] 1+ = not serious, treatment may or may not be given; 2+ = moderately serious, treatment often given; 4+ = serious, treatment given especially in disseminated disease.

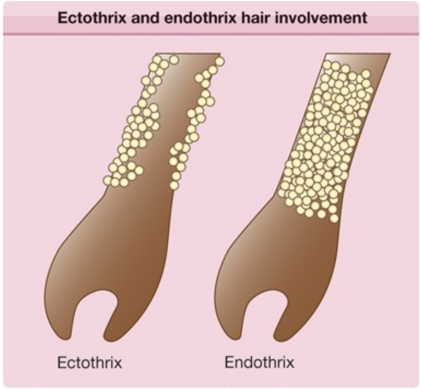
Table 3.5: Dermatophytes

Epidermophyton	Trichophyton	Microsporum
E. floccuosum	*T. mentagrophytes* *T. rubrum* *T. verrucosum* *T. tonsurans* *T. violaceum*	*M. canis* *M. audouinii* *M. equinum* *M. fulvum* *M. gypseum*

Table 3.6: Types of dermatophytoses

- Tinea capitis (head)
- Tinea barbae (face)
- Tinea corporis (body)
- Tinea unguinum (nail)
- Tinea pedis (foot)





Source: Goldsmith LA, Katz SI, Gilchrest BA, Paller AS, Leffell DJ, Wolff K: *Fitzpatrick's Dermatology in General Medicine, 8th Edition*: www.accessmedicine.com

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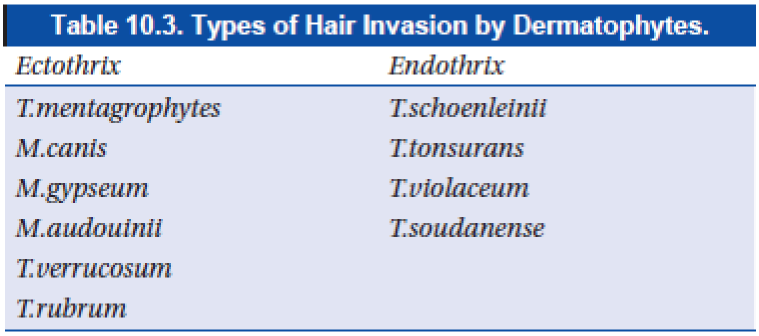


Table 10.3. Types of Hair Invasion by Dermatophytes.

Ectothrix	*Endothrix*
T.mentagrophytes	*T.schoenleinii*
M.canis	*T.tonsurans*
M.gypseum	*T.violaceum*
M.audouinii	*T.soudanense*
T.verrucosum	
T.rubrum	

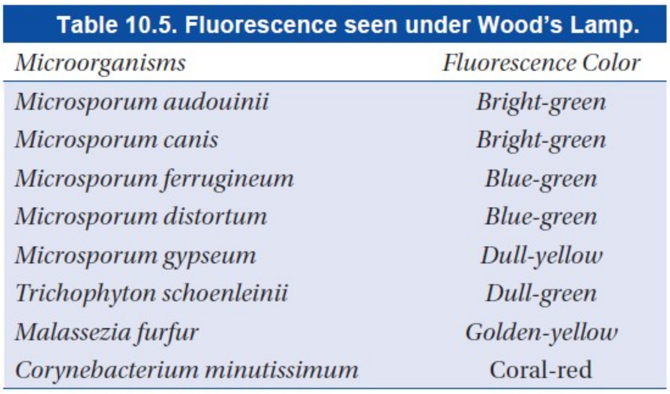
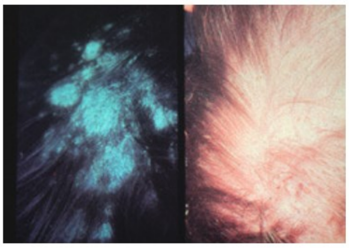


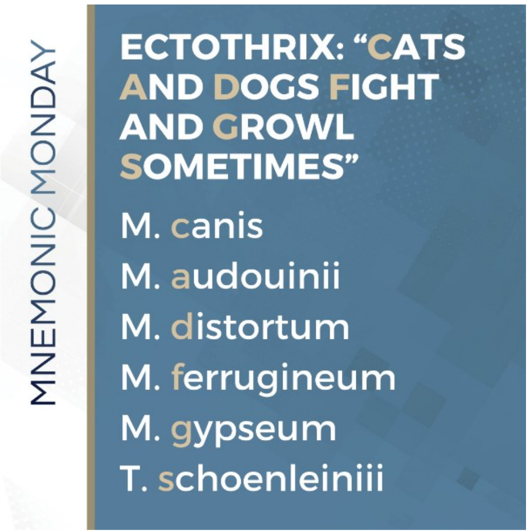
Table 10.5. Fluorescence seen under Wood's Lamp.

Microorganisms	*Fluorescence Color*
Microsporum audouinii	*Bright-green*
Microsporum canis	*Bright-green*
Microsporum ferrugineum	*Blue-green*
Microsporum distortum	*Blue-green*
Microsporum gypseum	*Dull-yellow*
Trichophyton schoenleinii	*Dull-green*
Malassezia furfur	*Golden-yellow*
Corynebacterium minutissimum	Coral-red

Fig. 10.12. Wood's Lamp Examination in a patient of tinea capitis.



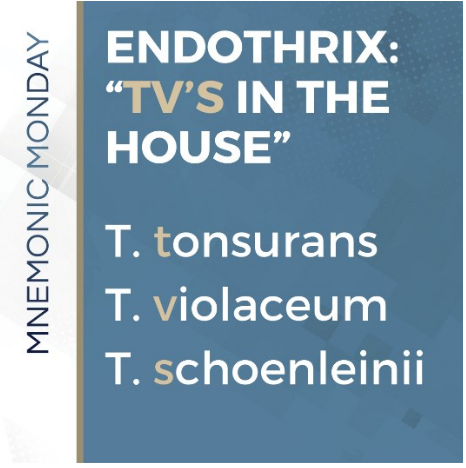
Tinea capitis with positive Wood's lamp due to Microsporum canis:
Note the green fluorescence on the left in an area of alopecia. The organism invades the outer sheath of the hair follicle, hence the positive Wood's lamp. Trichophyton tonsuransis the MCC of tinea capitis. It invades the inner hair shaft, hence a negative Wood's lamp.



MNEMONIC MONDAY

ECTOTHRIX: "CATS AND DOGS FIGHT AND GROWL SOMETIMES"

M. canis
M. audouinii
M. distortum
M. ferrugineum
M. gypseum
T. schoenleiniii



MNEMONIC MONDAY

ENDOTHRIX: "TV'S IN THE HOUSE"

T. tonsurans
T. violaceum
T. schoenleinii

705. Storage of Microorganisms, Most Effective Intracellular Environment Agent
a) Glycerol
b) Lactose

c) Mannitol
d) Skim milk
e) Sorbitol
Key: a) Glycerol

Glycerol is a commonly used cryoprotectant. It penetrates the cell and helps reduce intracellular ice formation, stabilizing the cellular environment during storage at low temperatures (e.g., -80°C or in liquid nitrogen).

706. Jock Itch, White Puffy Colonies, Yellow Reverse, No Microconidia, Abundant Club Shaped Macroconidia, Abundant Chlamydospores
a) Epidermophyton floccosum
b) Microsporum canis
c) Trichophyton mentagrophytes
d) Microsporum gypseum
e) Trichophyton rubrum
Key: CORRECTION = EPIDERMOPHYTON FLOCOSSUM

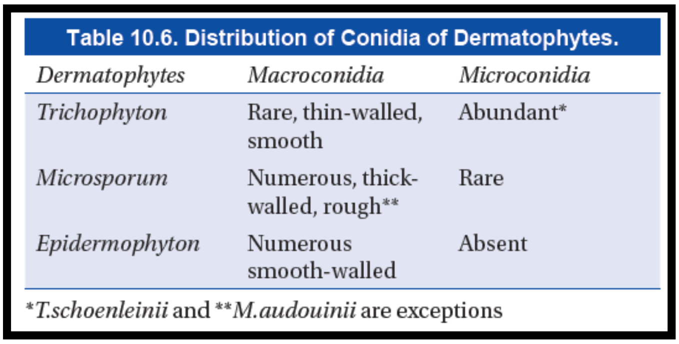
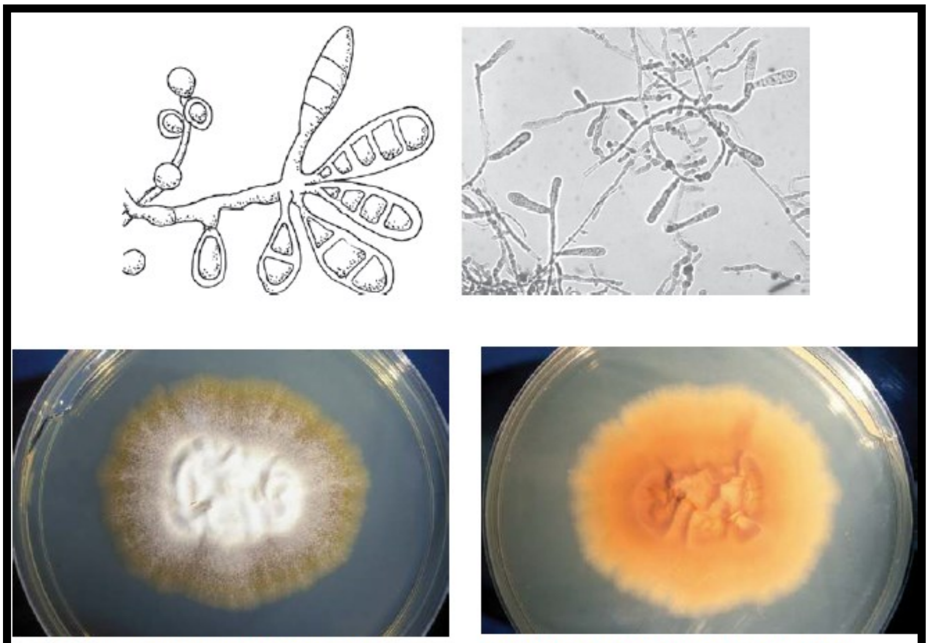


Table 10.6. Distribution of Conidia of Dermatophytes.

Dermatophytes	*Macroconidia*	*Microconidia*
Trichophyton	Rare, thin-walled, smooth	Abundant*
Microsporum	Numerous, thick-walled, rough**	Rare
Epidermophyton	Numerous smooth-walled	Absent

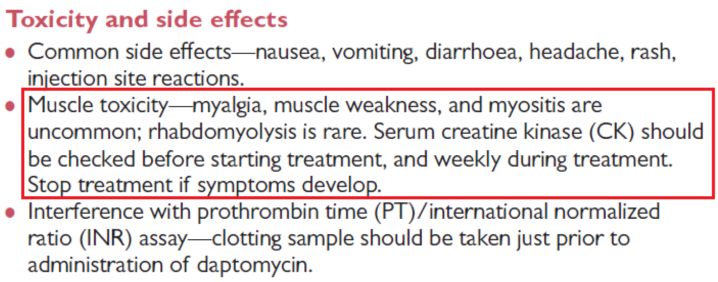
**T.schoenleinii* and ***M.audouinii* are exceptions



Epidermophyton floccosum. PDA, 30°C, 12 days. Surface of colony.

Epidermophyton floccosum. PDA, 30°C, 12 days. Reverse of colony.

707. IV Daptomycin Given to a Patient, What Needs to Be Monitored?
a) Creatinine
b) Alkaline Phosphatase
c) Platelets
d) Creatinine Phosphokinase
e) ALT
Key: d) Creatinine Phosphokinase

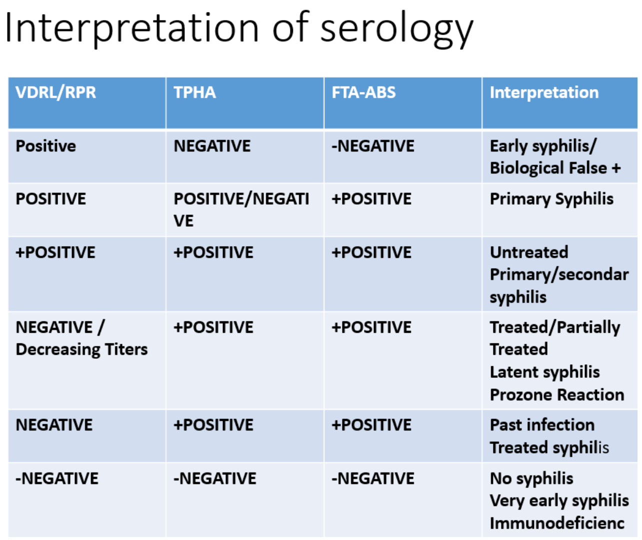


Toxicity and side effects

- Common side effects—nausea, vomiting, diarrhoea, headache, rash, injection site reactions.
- Muscle toxicity—myalgia, muscle weakness, and myositis are uncommon; rhabdomyolysis is rare. Serum creatine kinase (CK) should be checked before starting treatment, and weekly during treatment. Stop treatment if symptoms develop.
- Interference with prothrombin time (PT)/international normalized ratio (INR) assay—clotting sample should be taken just prior to administration of daptomycin.

708. VDRL Negative, TPHA Positive, Interpret

a) Primary
b) Secondary
c) Tertiary
d) Untreated
e) Treated
Key: Prefer E



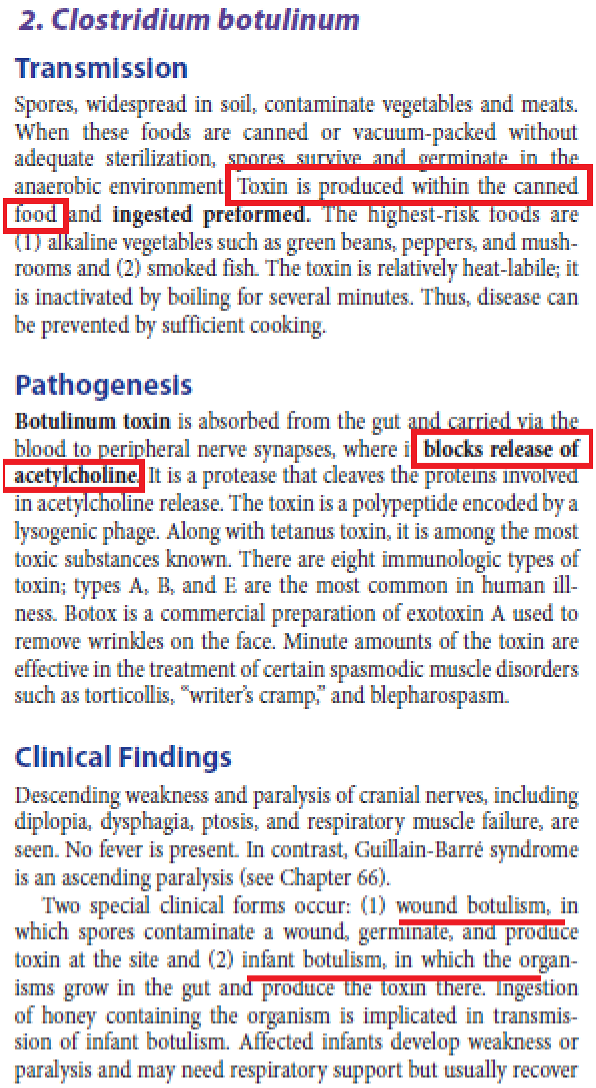
Interpretation of serology

VDRL/RPR	TPHA	FTA-ABS	Interpretation
Positive	NEGATIVE	-NEGATIVE	Early syphilis/ Biological False +
POSITIVE	POSITIVE/NEGATIVE	+POSITIVE	Primary Syphilis
+POSITIVE	+POSITIVE	+POSITIVE	Untreated Primary/secondar syphilis
NEGATIVE / Decreasing Titers	+POSITIVE	+POSITIVE	Treated/Partially Treated Latent syphilis Prozone Reaction
NEGATIVE	+POSITIVE	+POSITIVE	Past infection Treated syphilis
-NEGATIVE	-NEGATIVE	-NEGATIVE	No syphilis Very early syphilis Immunodeficienc

709. A mother brings her 5 months old child with the complaints of progressive muscle weakness and inability to hold his head. The mother gives the history of feeding him with soy based formula sweetened with honey.

a) Clostridium botulinum
b) Clostridium perfringens
c) Clostridium difficle
d) Bacillus Anthracis
e) E Coli

Key: a



2. *Clostridium botulinum*

Transmission

Spores, widespread in soil, contaminate vegetables and meats. When these foods are canned or vacuum-packed without adequate sterilization, spores survive and germinate in the anaerobic environment. Toxin is produced within the canned food and **ingested preformed.** The highest-risk foods are (1) alkaline vegetables such as green beans, peppers, and mushrooms and (2) smoked fish. The toxin is relatively heat-labile; it is inactivated by boiling for several minutes. Thus, disease can be prevented by sufficient cooking.

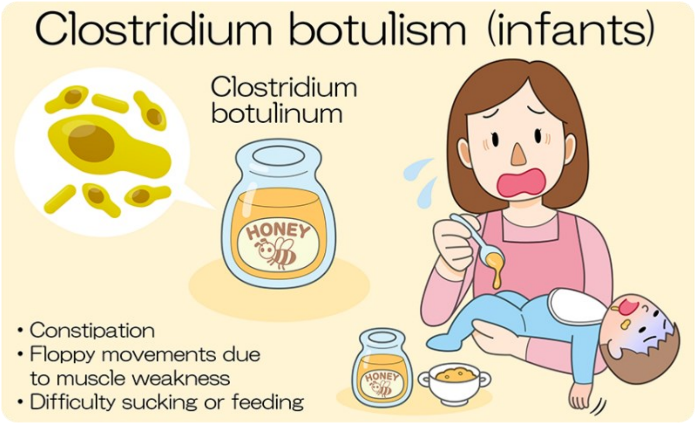
Pathogenesis

Botulinum toxin is absorbed from the gut and carried via the blood to peripheral nerve synapses, where it **blocks release of acetylcholine.** It is a protease that cleaves the proteins involved in acetylcholine release. The toxin is a polypeptide encoded by a lysogenic phage. Along with tetanus toxin, it is among the most toxic substances known. There are eight immunologic types of toxin; types A, B, and E are the most common in human illness. Botox is a commercial preparation of exotoxin A used to remove wrinkles on the face. Minute amounts of the toxin are effective in the treatment of certain spasmodic muscle disorders such as torticollis, "writer's cramp," and blepharospasm.

Clinical Findings

Descending weakness and paralysis of cranial nerves, including diplopia, dysphagia, ptosis, and respiratory muscle failure, are seen. No fever is present. In contrast, Guillain-Barré syndrome is an ascending paralysis (see Chapter 66).

Two special clinical forms occur: (1) wound botulism, in which spores contaminate a wound, germinate, and produce toxin at the site and (2) infant botulism, in which the organisms grow in the gut and produce the toxin there. Ingestion of honey containing the organism is implicated in transmission of infant botulism. Affected infants develop weakness or paralysis and may need respiratory support but usually recover


Clostridium botulism (infants)
Clostridium botulinum
HONEY
• Constipation
• Floppy movements due to muscle weakness
• Difficulty sucking or feeding
HONEY

710. A 25 years old man presents with fever and headache. He gives the history of swimming and diving in warm fresh water lakes near Karachi. Clinician suspect that the pathogen gained access via cribriform plate.

a) Rhizopus
b) Naegleria fowleri
c) Entamoeba histolytica
d) Acanthamoeba
e) Balantidium coli

Key: b

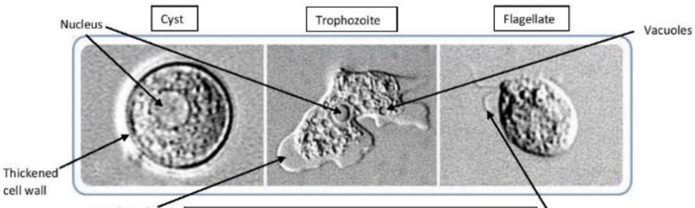
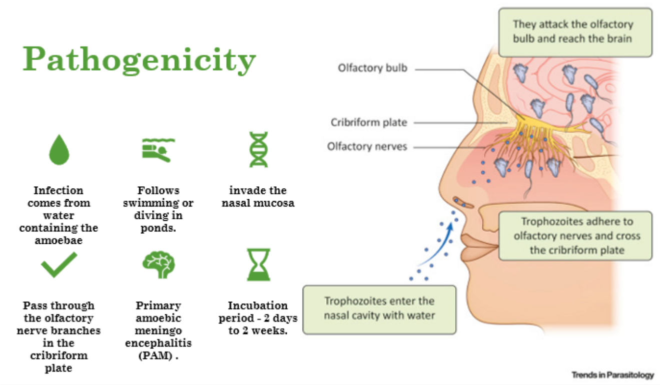

Nucleus
Cyst
Trophozoite
Flagellate
Vacuoles
Thickened cell wall
pseudopodia
Flagella

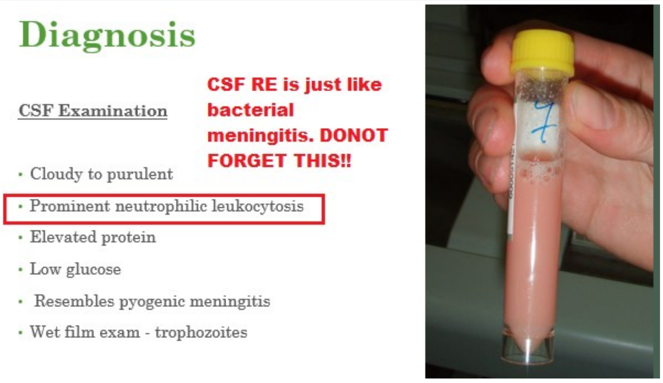
Figure 24: Three shapes of the Naegleria fowleri


Pathogenicity

- Infection comes from water containing the amoebae
- Follows swimming or diving in ponds.
- invade the nasal mucosa
- Pass through the olfactory nerve branches in the cribriform plate
- Primary amoebic meningo encephalitis (PAM) .
- Incubation period - 2 days to 2 weeks.

Olfactory bulb
Cribriform plate
Olfactory nerves
They attack the olfactory bulb and reach the brain
Trophozoites adhere to olfactory nerves and cross the cribriform plate
Trophozoites enter the nasal cavity with water

Trends in Parasitology


Diagnosis

CSF Examination

CSF RE is just like bacterial meningitis. DONOT FORGET THIS!!

- Cloudy to purulent
- Prominent neutrophilic leukocytosis
- Elevated protein
- Low glucose
- Resembles pyogenic meningitis
- Wet film exam - trophozoites

711. A 35 years man develops fever , he also complains of pain and difficulty in opening the jaw along with pain in testes. Physical examination revealed bilateral parotid gland swelling and orchitis.

a) Measels
b) Mumps
c) Rubella Infection
d) Croup
e) Influenza infection

Key: b

712. A 30 years old man suffers from road traffic accident. He suffers from severe trauma of lower limbs for which he undergoes surgery and debridement of soft tissue. Few days later he develops infection. Physical examination shows crepitus of the tissue of legs with foul smelling discharge. X ray shows radiolucent pockets in soft tissues. Treating physician suspects toxin production by the causative agent.

a) Endotoxin
b) Enterotoxin
c) Alpha toxin
d) Neurotoxin
e) Exotoxin

Key: c

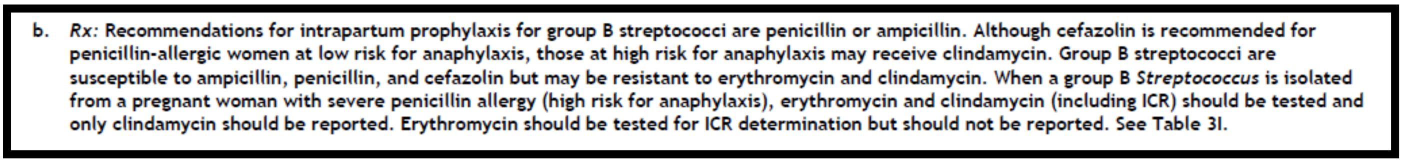
713. A 30 years old female gives birth to a child, she lives in rural areas of Sindh, there was no antenatal and perinatal facilities available. It was a spontaneous vaginal delivery. 3 days after the birth the infant develops fever, fits and refuses to take feed. CSF shows high protein and low glucose levels. CSF culture yielded the growth of beta hemolytic colonies.

a) Mother should avoid cheese in pregnancy
b) Vaccination of mother
c) Treatment of neonates eye with erythromycin
d) Immediate vaccination of infant

e) Giving IV ampicillin during labor

Key: E

MCQ NOT GOOD QUALITY AS LISTERIA AND GBS CAN BOTH BE BETA HEMOLYTIC. IN GOOD MCQ SHAPE & TYPE OF HEMOLYSIS (WIDE BETA / NARROW BETA)WILL BE GIVEN. If listeria avoid cheese. If GBS give ampicillin. Lekin yahan per assume kerlen k agar narrow zone of beta hemolysis naheen likha tou matlab yahi hoga keh wide zone hai, jo keh GBS ki hogi.

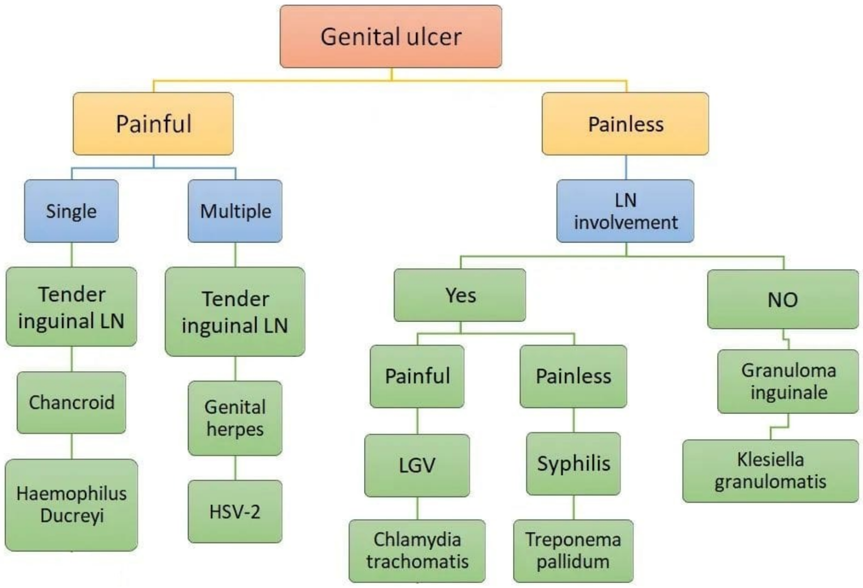


b. *Rx:* Recommendations for intrapartum prophylaxis for group B streptococci are penicillin or ampicillin. Although cefazolin is recommended for penicillin-allergic women at low risk for anaphylaxis, those at high risk for anaphylaxis may receive clindamycin. Group B streptococci are susceptible to ampicillin, penicillin, and cefazolin but may be resistant to erythromycin and clindamycin. When a group B *Streptococcus* is isolated from a pregnant woman with severe penicillin allergy (high risk for anaphylaxis), erythromycin and clindamycin (including ICR) should be tested and only clindamycin should be reported. Erythromycin should be tested for ICR determination but should not be reported. See Table 31.

714. A 45 years old male presents with incoordination, difficulty in maintaining balance and impaired proprioception. CT scan shows the degeneration of dorsal columns and dorsal roots of the spinal cord. He has past historyof painless ulcerated genital lesions.

a) Neisseria gonorrhoeae
b) Haemophilus ducreyi
c) Treponema pallidum
d) HSV 2
e) Varicella zoster virus

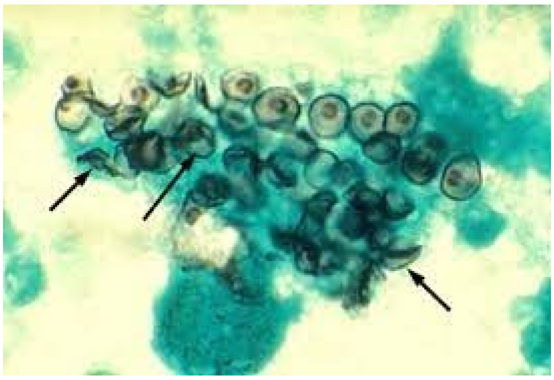
Key: c


Genital ulcer
Painful
Painless
Single
Multiple
LN involvement
Tender inguinal LN
Tender inguinal LN
Yes
NO
Chancroid
Genital herpes
Painful
Painless
Granuloma inguinale
Haemophilus Ducreyi
HSV-2
LGV
Syphilis
Klesiella granulomatis
Chlamydia trachomatis
Treponema pallidum

715. A 50 years old man who is IV drug abuser presents with complaints of fever, malaise , difficulty in breathing and respiratory distress. His Lab work up revealed he is HIV + with CD4 count less then 100.His BAL sample when stained with methenamine silver stain revealed the causative organism.

a) Staphylococcus aureus
b) Streptococcus pneumoniae
c) Histoplasma
d) Aspergillus
e) Pneumocystis jiroveci

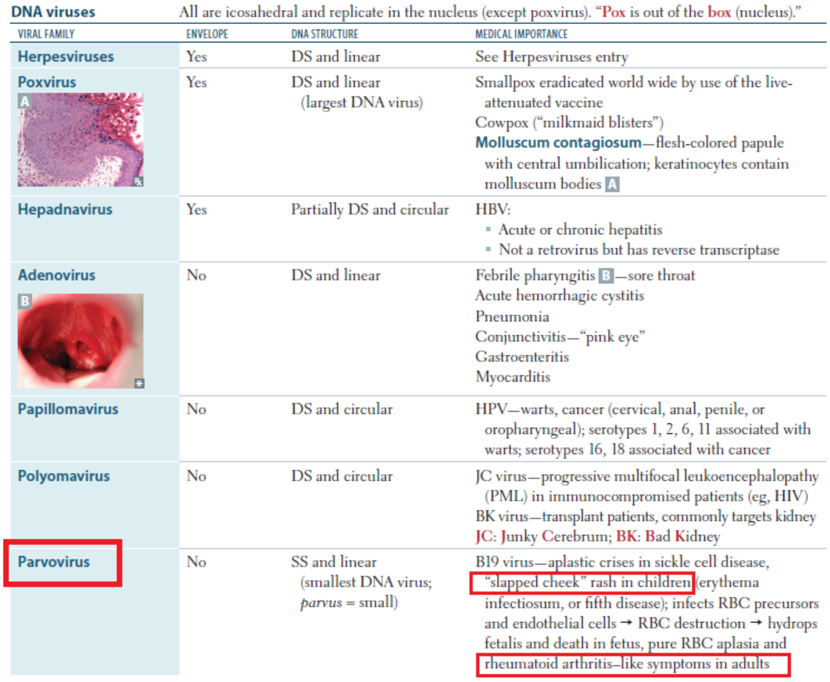
Key: e



716. A 40 years old female , who is a school teacher by profession develops pain and swelling in joints of her hands. She is prone to exposure of different infections because of close contact with the children . Along with pain and swelling she also gives history of morning stiffness. There was also tenderness in small joints of the hands. However, after seven days her symptoms started to improve and she started feeling better.

a) Human Herpes Virus 6
b) Varicella Zoster virus
c) Parvovirus B 19
d) Rubella
e) Measles

Key: c



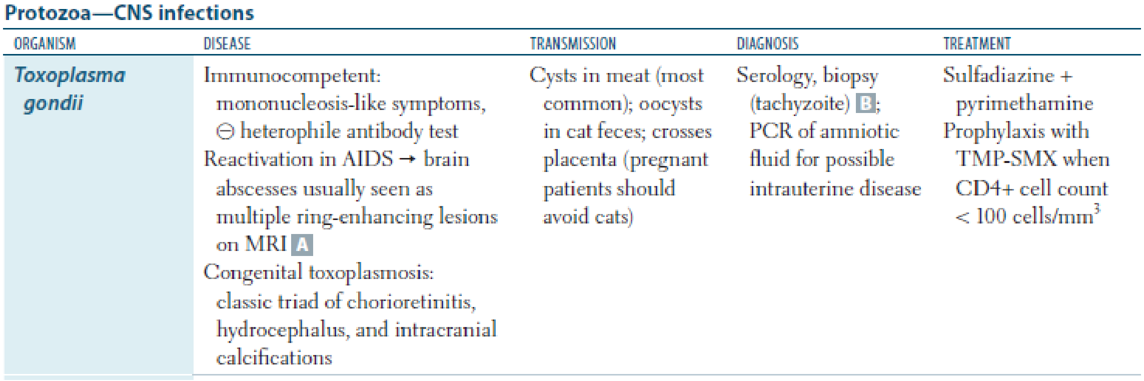
DNA viruses All are icosahedral and replicate in the nucleus (except poxvirus). "Pox is out of the box (nucleus)."

VIRAL FAMILY	ENVELOPE	DNA STRUCTURE	MEDICAL IMPORTANCE
Herpesviruses	Yes	DS and linear	See Herpesviruses entry
Poxvirus A	Yes	DS and linear (largest DNA virus)	Smallpox eradicated world wide by use of the live-attenuated vaccine Cowpox ("milkmaid blisters") **Molluscum contagiosum**—flesh-colored papule with central umbilication; keratinocytes contain molluscum bodies A
Hepadnavirus	Yes	Partially DS and circular	HBV: ▪ Acute or chronic hepatitis ▪ Not a retrovirus but has reverse transcriptase
Adenovirus B	No	DS and linear	Febrile pharyngitis B—sore throat Acute hemorrhagic cystitis Pneumonia Conjunctivitis—"pink eye" Gastroenteritis Myocarditis
Papillomavirus	No	DS and circular	HPV—warts, cancer (cervical, anal, penile, or oropharyngeal); serotypes 1, 2, 6, 11 associated with warts; serotypes 16, 18 associated with cancer
Polyomavirus	No	DS and circular	JC virus—progressive multifocal leukoencephalopathy (PML) in immunocompromised patients (eg, HIV) BK virus—transplant patients, commonly targets kidney JC: Junky Cerebrum; BK: Bad Kidney
Parvovirus	No	SS and linear (smallest DNA virus; *parvus* = small)	B19 virus—aplastic crises in sickle cell disease, "slapped cheek" rash in children (erythema infectiosum, or fifth disease); infects RBC precursors and endothelial cells → RBC destruction → hydrops fetalis and death in fetus, pure RBC aplasia and rheumatoid arthritis–like symptoms in adults

717. A 28 years old, 3 months pregnant female who is a veterinary doctor by profession, presents with fever, fatigue and malaise. On physical examination she has marked cervical lymphadenopathy. Blood CP shows moderate lymphocytosis. She has a history of exposure to pets due to her profession. Treating physician is concerned about transplacental transmission of infection to fetus.

a) Hydrops fetalis
b) Patent ductus arteriosus
c) Retinochoroiditis
d) Pulmonary stenosis

Key: c



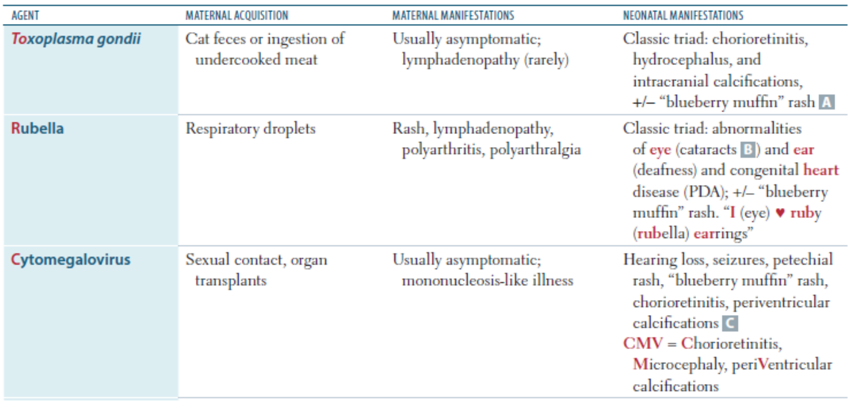
Protozoa—CNS infections

ORGANISM	DISEASE	TRANSMISSION	DIAGNOSIS	TREATMENT
Toxoplasma gondii	Immunocompetent: mononucleosis-like symptoms, ⊖ heterophile antibody test Reactivation in AIDS → brain abscesses usually seen as multiple ring-enhancing lesions on MRI A Congenital toxoplasmosis: classic triad of chorioretinitis, hydrocephalus, and intracranial calcifications	Cysts in meat (most common); oocysts in cat feces; crosses placenta (pregnant patients should avoid cats)	Serology, biopsy (tachyzoite) B; PCR of amniotic fluid for possible intrauterine disease	Sulfadiazine + pyrimethamine Prophylaxis with TMP-SMX when CD4+ cell count < 100 cells/mm^3

718. A newborn , born on 38 weeks of gestation is small for his age , he has multiple petechial rashes, hepatosplenomegaly, microcephaly with intracerebral calcifications.

a) Epstein-Barr virus
b) Cytomegalovirus
c) Herpes simplex type I virus
d) HIV
e) Varicella Zoster virus

Key: b



AGENT	MATERNAL ACQUISITION	MATERNAL MANIFESTATIONS	NEONATAL MANIFESTATIONS
Toxoplasma gondii	Cat feces or ingestion of undercooked meat	Usually asymptomatic; lymphadenopathy (rarely)	Classic triad: chorioretinitis, hydrocephalus, and intracranial calcifications, +/– "blueberry muffin" rash A
Rubella	Respiratory droplets	Rash, lymphadenopathy, polyarthritis, polyarthralgia	Classic triad: abnormalities of eye (cataracts B) and ear (deafness) and congenital heart disease (PDA); +/– "blueberry muffin" rash. "I (eye) ♥ ruby (rubella) earrings"
Cytomegalovirus	Sexual contact, organ transplants	Usually asymptomatic; mononucleosis-like illness	Hearing loss, seizures, petechial rash, "blueberry muffin" rash, chorioretinitis, periventricular calcifications C CMV = Chorioretinitis, Microcephaly, periVentricular calcifications

719. A 30 years old boy who is on holiday trip with his friends to northern areas of Pakistan presents with watery diarrhea and abdominal discomfort. He gives the history of consuming street food and water and juices from non hygienic sources.

a) Enterotoxigenic E Coli
b) Enteroaggregative E Coli
c) Enterohemorrhagic E Coli
d) Enteroinvasive E Coli
e) Enteropathogenic E Coli

Key: a

Enteropathogenic E. coli (EPEC):
Cause of infantile diarrhea (especially in developing countries).

Enterotoxigenic E. coli (ETEC):
Major cause of traveler's diarrhea.
Produces heat-labile toxin (LT) and heat-stable toxin (ST).
Causes watery diarrhea (not bloody).
Transmitted via contaminated water and food.

Enterohemorrhagic E. coli (EHEC):
Associated with bloody diarrhea and hemorrhagic colitis.
Can lead to hemolytic uremic syndrome (HUS).
Often caused by Shiga toxins (Stx1 and Stx2).
Common source: undercooked ground beef (especially O157:H7 strain). SMAC will appear as NLF

Enter invasive E. coli (EIEC):

Causes dysentery (bloody diarrhea with fever).
Invades and destroys colonic epithelial cells.
Similar to Shigella in terms of pathogenicity.

** Neonatal meningitis E. coli (NMEC):**
Cause of neonatal meningitis.
Associated with K1 capsular antigen.

720. A 45 years old farmer develops pustule on his hand along with localized lymphadenopathy. There was no fever and pain at the site of lesion. The pustule later on ruptures to form a black eschar which is surrounded by expanding edema. Gram stain shows box car shaped gram positive rods

a) Sporothix schenckii
b) Bacillus anthracis
c) Francisella tularensis
d) Bacillus cereus
e) Yersinia pestis
Key: CORRECTED = B

721. A 10 years old boy suffered from severe throat infection. He took antibiotics and condition improved in few days. However after several weeks he developed edema , hematuria and hypertension.
a) Streptococcus Pyogenes
b) Streptococcus Agalactiae
c) Streptococcus Pneumoniae
d) Enterococcus faecalis
e) Streptococcus Mutans
Key: a (Acute glomerulonephritis due to Streptococcus pyogenes)

722. A 15 years old boy presents with fever along with pain in right lower quadrant of abdomen .On the basis of clinical evaluation he is suspected to have appendicitis and his appendicectomy is performed. However, his appendix is found to be normal but mesenteric lymph nodes are enlarged with focal areas of micro abscesses. Sample taken from his abdomen yielded the growth of gram negative rods which showed growth at 22 degree Celsius.

a) E coli
b) Enterococcus faecalis
c) Yersinia Enterocolitica
d) Chlamydia
e) Pseudomonas aeruginosa
Key: c
 Mesenteric lymphadenitis: A hallmark of *Yersinia enterocolitica* infection, especially in children and young adults, presenting with abdominal pain and fever.
 Cold temperature growth: *Yersinia enterocolitica is a **psychrotroph**, meaning it can grow at lower temperatures, such as **4°C** (refrigerator temperature) and up to **22°C**.*

723. A 40-year-old man is admitted with fever, shortness of breath, cough and cyanosis. His chest X ray reveals consolidation in the right lower lobe (Single lobe).

a) Klebsiella Pneumoniae
b) Pseudomonas aeruginosa
c) Acinetobacter baumanii
d) Streptococcus pneumoniae
e) Streptococcus pyogenes
Key: CORRECTED = D (S. pneumoniae is the most common cause of CAP)

724. A 30 years old female who is at 30 weeks gestation presents with headache , fever and body aches. After some days she suffers from spontaneous abortion. Severe amnionitis is revealed on examination of products of abortion.

a) Mosquito bite

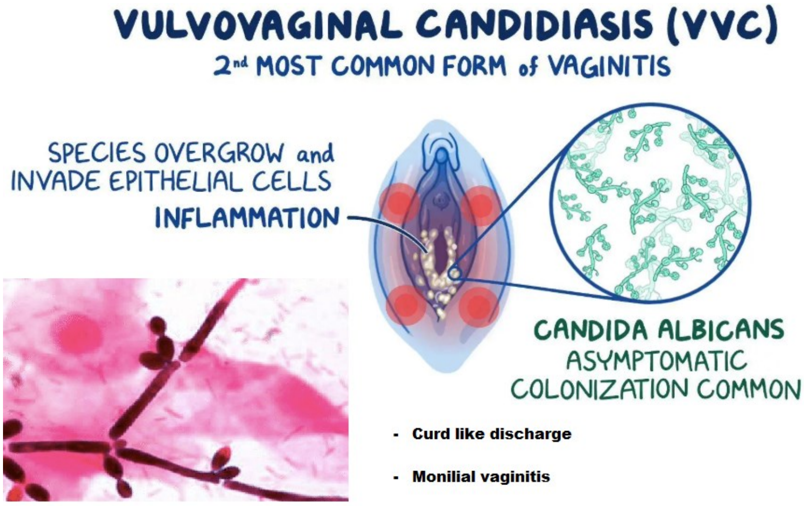
b) Rat bite
c) Sexual Activity
d) Eating soft cheese
e) Eating raw fish

Key: d (Organism is Listeria monocytogenes)

725. A 35 Years old female presents with progressive vaginal pruritis for 5 days. She suffered from urinary tract infection in recent past for which she was treated with Trimethoprim/sulfamethoxazole. On examination there is erythema of vulvar area along with white vaginal discharge .HVS taken and inoculated in animal serum. What feature is most likely to be seen after 3 - 4 hours ?

a) Encapsulated Yeast
b) Artho conidia
c) Microconidia
d) Macroconidia
e) Pseudo Hyphae

Key: e


VULVOVAGINAL CANDIDIASIS (VVC)
2nd MOST COMMON FORM of VAGINITIS
SPECIES OVERGROW and INVADE EPITHELIAL CELLS
INFLAMMATION
CANDIDA ALBICANS
ASYMPTOMATIC COLONIZATION COMMON

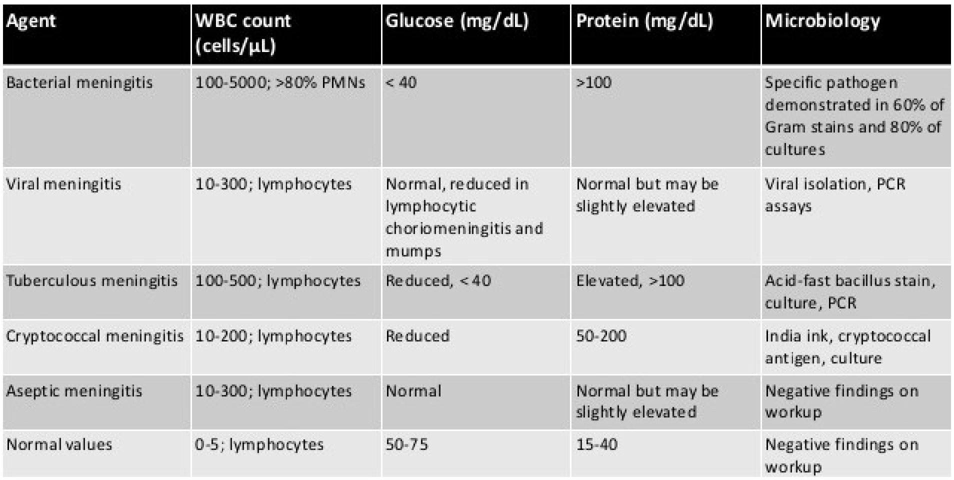
- **Curd like discharge**
- **Monilial vaginitis**

726. A 65 years old alcoholic male presents to emergency department with the complaints of fever, headache and confusion for the past 3 days. He also complained of neck stiffness and rigidity. On physical examination his Kernigs and Brudzinkis signs were positive. His CSF examination revealed cell count of 80 per cubic mm with predominant lymphocytes. Proteins were 20mg/dl and glucose was 25mg/dl.

a) Neisseria Meningitidis
b) Listeria Monocytogenes
c) Streptococcus Pneumoniae
d) Aerobic Gram Negative Bacilli
e) E.Coli

Key: b

Listeria monocytogenes **is a common cause of meningitis in elderly or immunocompromised patients, especially those with alcoholism. It can cause lymphocytic predominance in CSF with low glucose and normal protein.**

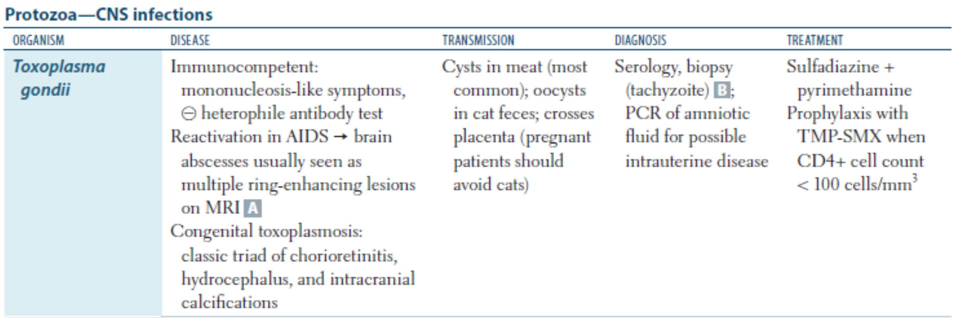


Agent	WBC count (cells/µL)	Glucose (mg/dL)	Protein (mg/dL)	Microbiology
Bacterial meningitis	100-5000; >80% PMNs	< 40	>100	Specific pathogen demonstrated in 60% of Gram stains and 80% of cultures
Viral meningitis	10-300; lymphocytes	Normal, reduced in lymphocytic choriomeningitis and mumps	Normal but may be slightly elevated	Viral isolation, PCR assays
Tuberculous meningitis	100-500; lymphocytes	Reduced, <40	Elevated, >100	Acid-fast bacillus stain, culture, PCR
Cryptococcal meningitis	10-200; lymphocytes	Reduced	50-200	India ink, cryptococcal antigen, culture
Aseptic meningitis	10-300; lymphocytes	Normal	Normal but may be slightly elevated	Negative findings on workup
Normal values	0-5; lymphocytes	50-75	15-40	Negative findings on workup

727. A 38 years old female presented with severe headache and nausea. She has a past history of heart transplant 1 year ago. Ring enhancing lesions were identified on her CT scan and multiple cyst like structures were identified on the biopsy of the brain tissue. Cultures were negative. What is the most probable cause?

a) Complication of transplant
b) Eating cysts in under cooked meat
c) Reactivation of latent infection
d) Ingestion of oocysts from cat feces
e) Transfusion of infected blood

Key: c (if single enhancing lesion = suspect EBV CNS lymphoma)



Protozoa—CNS infections

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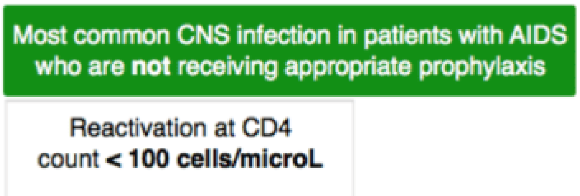
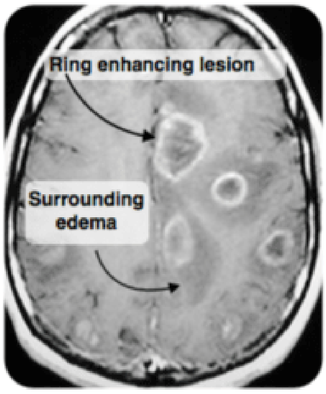
In immunocompromised patients, such as those who have undergone organ transplants, reactivation of latent toxoplasmosis is a common cause of ring-enhancing brain lesions with cyst-like structures seen on imaging and biopsy.



Most common CNS infection in patients with AIDS who are **not** receiving appropriate prophylaxis

Reactivation at CD4 count **< 100 cells/microL**



728. A 30 years old pregnant female presents with fever, generalized body aches and weakness. She is in her first trimester of pregnancy. Her investigations showed Positive antibodies to Toxoplasma gondii . She gives the birth to a baby on completion of her term. The neonate is healthy with no signs of infection. Which one should be helpful in baby

A. IgA
B. IgM
C. IgG
D. IgE
E. IgG1
Key: b

IgM antibodies are produced in response to recent infection and are the first antibodies to appear in the acute phase of infection. In the case of congenital toxoplasmosis, IgM detected in the neonate's blood would suggest that the infection was transmitted from the mother during pregnancy and the baby is actively infected. (IgG ka aik masla yay bi hai keh wo placenta cross ker jaati hai, tou mama vs baby infection ka difference mushkil hoga)

729. A 20 years old boy who is attending football training camp for past 1 month presents with progressive pruritis of both feet. Physical examination shows erythematous lesions on both feet which are more marked on interdigital web spaces and soles.
A. Malassezia furfur
B. Sprothrix schenckii
C .Tricophyton rubrum
D. Histoplasma capsulatum
E. Rhizopus
Key: c

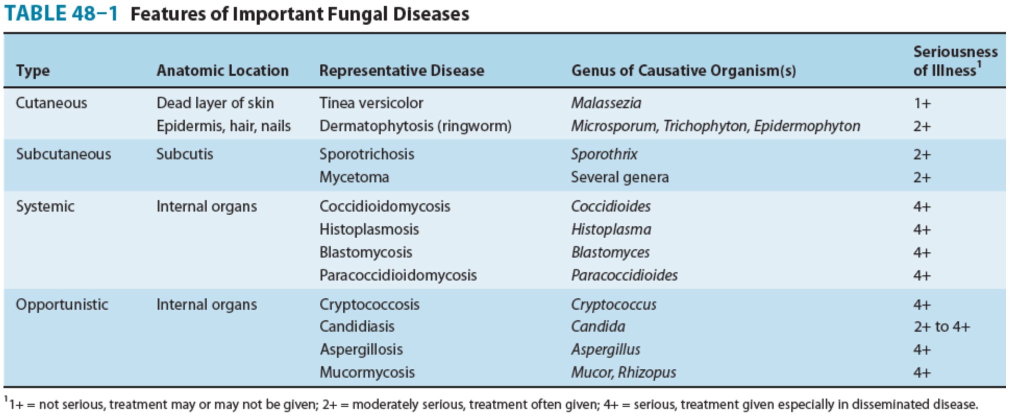
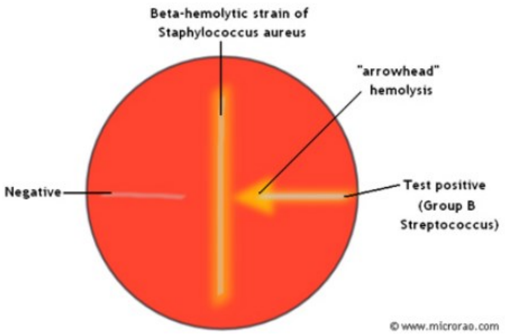


TABLE 48–1 **Features of Important Fungal Diseases**

Type	Anatomic Location	Representative Disease	Genus of Causative Organism(s)	Seriousness of Illness[1]
Cutaneous	Dead layer of skin	Tinea versicolor	*Malassezia*	1+
	Epidermis, hair, nails	Dermatophytosis (ringworm)	*Microsporum, Trichophyton, Epidermophyton*	2+
Subcutaneous	Subcutis	Sporotrichosis	*Sporothrix*	2+
		Mycetoma	Several genera	2+
Systemic	Internal organs	Coccidioidomycosis	*Coccidioides*	4+
		Histoplasmosis	*Histoplasma*	4+
		Blastomycosis	*Blastomyces*	4+
		Paracoccidioidomycosis	*Paracoccidioides*	4+
Opportunistic	Internal organs	Cryptococcosis	*Cryptococcus*	4+
		Candidiasis	*Candida*	2+ to 4+
		Aspergillosis	*Aspergillus*	4+
		Mucormycosis	*Mucor, Rhizopus*	4+

[1] 1+ = not serious, treatment may or may not be given; 2+ = moderately serious, treatment often given; 4+ = serious, treatment given especially in disseminated disease.

730. A 3 weeks old new born presents with fever , refusal to take feed and seizures. It was a normal vaginal delivery at home without any complication. Physical examination reveals neck stiffness and bulging fontanelles. CSF taken by lumbar puncture shows raised proteins and lower glucose levels. Gram stain shows Gram Positive Cocci in chains.
A. Alpha hemolysis
B. CAMP test positive
C. Optochin sensitivity
D. Bacitracin sensitivity
E. Growth on bile esculin agar
Key: b


Beta-hemolytic strain of Staphylococcus aureus
"arrowhead" hemolysis
Negative
Test positive (Group B Streptococcus)
© www.microrao.com

This test detects a diffusible, heat-stable, extracellular protein produced by Group B Streptococcus that enhances the hemolysis of sheep erythrocytes by Staphylococcus aureus. The CAMP factor acts

synergistically with the beta hemolysin produced by S. aureus to induce enhanced hemolysis of sheep or bovine RBCs but not human, rabbit or horse RBCs.

731. A 20 years old boy who gives history of travelling from USA 3 days back presents with multiple episodes of watery diarrhea. He is also having severe abdominal cramps with fever. An over night stool culture at 42 degrees Celsius shows growth of microaerophilic, oxidase positive, gram negative curved rods .

A. Staphylococcus aureus
B. Salmonella typhi
C. Listeria monocytogenes
D. Clostridium botulinum
E. Campylobacter jejuni
Key: e

732. A 10 years old girl who loves to keep pets presents with fever and painful enlarged lymph nodes in left axillary region. Histological examination of the biopsy of the lymph nodes shows granulomas with necrotic debris.

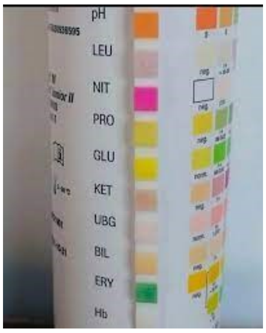
A . Borrelia burgdorferi
B . Bartonella henselae
C . Coxiella burnetii
D . Yersinia Pestis
E . Rickettsia prowazekii
Key: b

This child presents with fever and painful enlarged lymph nodes in the left axillary region, which is highly suggestive of cat scratch disease (CSD). Bartonella henselae is the causative agent of cat scratch disease, and it is typically transmitted through scratches or bites from cats

733. A 40 years old female presents with the complaints of burning micturition and fever for last 3 days. Urine sample taken shows positive leukocyte esterase and negative nitrite. Culture shows significant number of bacterial colonies.

A . E coli
B . Pseudomonas aeruginosa
C . Klebsiella pneumoniae
D . Proteus mirabilis
E . Enterococcus faecalis
Key: e

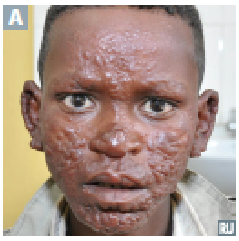
ENTEROBACTERALES AND PSEUDOMONAS AERUGINOSA ARE POSITIVE FOR NITRATE REDUCTASE ENZYME

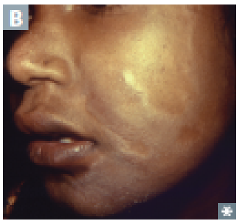


734. A 70 years female presents with thick, erythematous nodules on nose and ears. She is also complaining of loss of sensation on the effected area. These nodules have a slow course of development and developed in years. Biopsy revealed granulomas with giant cells and acid fast bacteria. However no growth is detected on routine culture media and LJ medium.

A . Cutaneous Leishmaniasis
B . Smallpox
C . Measels
D . Lepromatous leprosy
E . Tuberculoid leprosy
Key: CORRECTED = E

Leprosy





Also called Hansen disease. Caused by *Mycobacterium leprae*, an acid-fast bacillus that likes cool temperatures (infects skin and superficial nerves—"glove and stocking" loss of sensation) and cannot be grown in vitro. Diagnosed via skin biopsy or tissue PCR. Reservoir in United States: armadillos.

Leprosy has 2 forms (many cases fall temporarily between two extremes):

- Lepromatous—presents diffusely over the skin, with leonine (lionlike) facies A, and is communicable (high bacterial load); characterized by low cell-mediated immunity with a largely Th2 response. Lepromatous form can be lethal.
- Tuberculoid—limited to a few hypoesthetic, hairless skin plaques B; characterized by high cell-mediated immunity with a largely Th1-type response and low bacterial load.

Treatment: dapsone and rifampin for tuberculoid form; clofazimine is added for lepromatous form.

Pathogenesis

The organism replicates intracellularly, typically within skin histiocytes, endothelial cells, and the Schwann cells of nerves. The nerve damage in leprosy is the result of two processes: damage caused by direct contact with the bacterium and damage caused by CMI attack on the nerves.

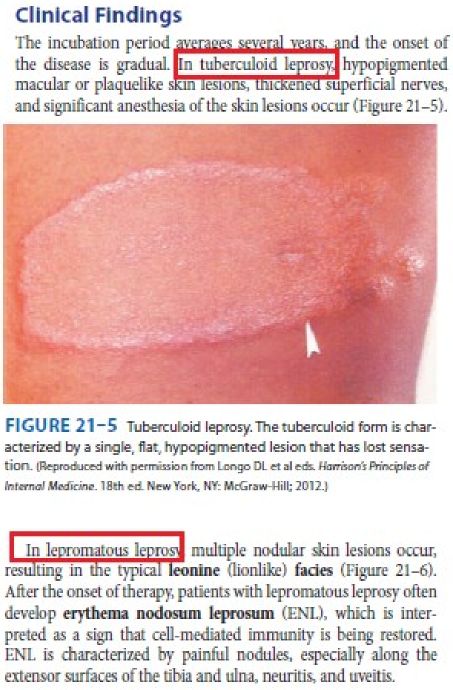
There are two distinct forms of leprosy—**tuberculoid** and **lepromatous**—with several intermediate forms between the two extremes (Table 21–5).

(1) In tuberculoid (also known as **paucibacillary**) leprosy, the CMI response to the organism limits its growth, very few acid-fast bacilli are seen, and granulomas containing giant cells form. The nerve damage seems likely to be caused by cell-mediated immunity as there are few organisms and the CMI response is strong.

The CMI response consists primarily of CD4-positive cells and a Th-1 profile of cytokines, namely, interferon-γ, interleukin-2, and interleukin-12. It is the CMI response that causes the nerve damage seen in tuberculoid leprosy.

The lepromin skin test result is positive. The lepromin skin test is similar to the tuberculin test (see earlier). An extract of *M. leprae* is injected intradermally, and induration is observed 48 hours later in those in whom a CMI response against the organism exists.

(2) In lepromatous (also known as **multibacillary**) leprosy, the cell-mediated response to the organism is poor, the skin and mucous membrane lesions contain large numbers of organisms, foamy histiocytes rather than granulomas are found, and the lepromin skin test result is negative. The nerve damage seems likely to be caused by direct contact as there are many organisms and the CMI response is poor.



Clinical Findings

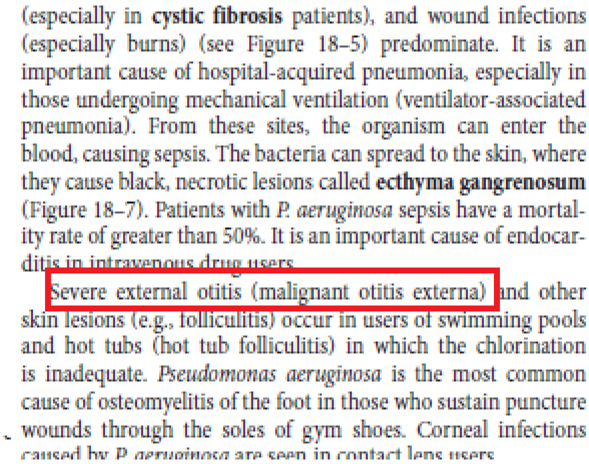
The incubation period averages several years, and the onset of the disease is gradual. In tuberculoid leprosy, hypopigmented macular or plaquelike skin lesions, thickened superficial nerves, and significant anesthesia of the skin lesions occur (Figure 21–5).

FIGURE 21–5 Tuberculoid leprosy. The tuberculoid form is characterized by a single, flat, hypopigmented lesion that has lost sensation. (Reproduced with permission from Longo DL et al eds. *Harrison's Principles of Internal Medicine*. 18th ed. New York, NY: McGraw-Hill; 2012.)

In lepromatous leprosy multiple nodular skin lesions occur, resulting in the typical **leonine** (lionlike) **facies** (Figure 21–6). After the onset of therapy, patients with lepromatous leprosy often develop **erythema nodosum leprosum** (ENL), which is interpreted as a sign that cell-mediated immunity is being restored. ENL is characterized by painful nodules, especially along the extensor surfaces of the tibia and ulna, neuritis, and uveitis.

735. A 65 years old male , known diabetic and hypertensive presents with severe pain in his right ear associated with pus discharge from ear canal. Physical examination revealed swelling and tenderness in mastoid region. ENT specialist suspects malignant otitis externa.

A . Pseudomonas aeruginosa
B . Streptococcus pneumoniae
C . Staphylococcus aureus
D . Moraxella catheralis
E . H . Influenza
Key: a



(especially in **cystic fibrosis** patients), and wound infections (especially burns) (see Figure 18–5) predominate. It is an important cause of hospital-acquired pneumonia, especially in those undergoing mechanical ventilation (ventilator-associated pneumonia). From these sites, the organism can enter the blood, causing sepsis. The bacteria can spread to the skin, where they cause black, necrotic lesions called **ecthyma gangrenosum** (Figure 18–7). Patients with *P. aeruginosa* sepsis have a mortality rate of greater than 50%. It is an important cause of endocarditis in intravenous drug users.

Severe external otitis (malignant otitis externa) and other skin lesions (e.g., folliculitis) occur in users of swimming pools and hot tubs (hot tub folliculitis) in which the chlorination is inadequate. *Pseudomonas aeruginosa* is the most common cause of osteomyelitis of the foot in those who sustain puncture wounds through the soles of gym shoes. Corneal infections caused by *P. aeruginosa* are seen in contact lens users.

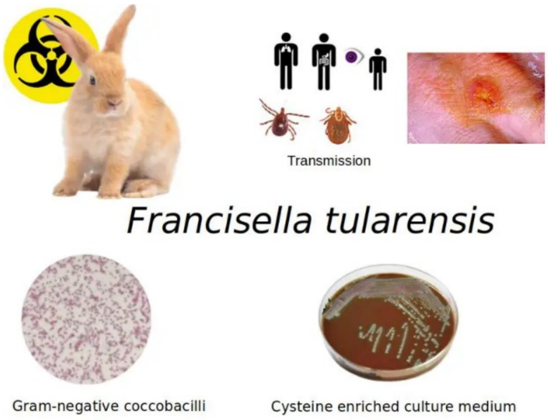
736. A 50 years old male presents with altered social behavior, impaired memory, poor sense of judgement and insight. In past he was a sexually active male and had been detained by police for such activities. Several years later disease progressed and he developed expressionless face, tremors, dysarthria and neurological deficit. Which one be useful

A . CSF Proteins
B .Gram Stain of CSF
C .FTA - ABS on CSF
D .CT Scan Brain
E .VDRL
Key: c

737. A 45 years old male who is a patient of Bronchogenic carcinoma is on Chemotherapy and Immunosuppressive therapy for which IV catheters are placed. He develops fever and his paired blood cultures samples revealed the growth of Gram Positive Cocci in Clusters. Colonies are non hemolytic on blood agar.

A .Optochin resistance
B .Bacitracin resistance
C .Novobiocin Sensitive
D .Catalase Negative
E .Oxidase Positive
Key: c

738. A 40 years old man who is a hunter , recently returned from hunting of rabbits and deer develops fever, chills and myalgias. He also develops ulcer with black base on his hand and regional lymph nodes are also enlarged.
A .Leptospira
B .Brucella
C .Borrelia
D .Francisella
E .Listeria
Key: d



739. A 30 years old female presents with the symptoms of urinary tract infection. Her urine culture yielded the pure growth of Gram positive cocci. When sensitivity was applied it revealed that the isolate is resistant to Ciprofloxacin due to

A . Episome
B . Conjugative Plasmid
C . Chromosome
D . Prophage
E . Non Conjugative Plasmid
Key: b

740. A 8 years old by develops behavioral changes along with deterioration in performance at school. His disease progressed leading to seizures, ataxia and focal neurological deficit. He later on became quadriplegic and died within 1 year of onset of symptoms . Later on he was labelled as a case subacute sclerosing panencephalitis .

A . Mumps
B . Parvovirus B19
C . Rubella
D . Measles
E . Polio
Key: d

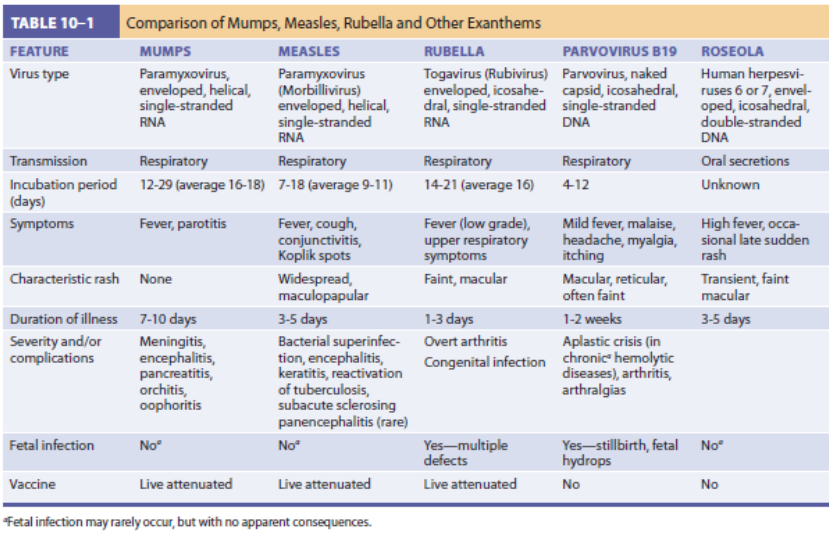


TABLE 10–1 Comparison of Mumps, Measles, Rubella and Other Exanthems

FEATURE	MUMPS	MEASLES	RUBELLA	PARVOVIRUS B19	ROSEOLA
Virus type	Paramyxovirus, enveloped, helical, single-stranded RNA	Paramyxovirus (Morbillivirus) enveloped, helical, single-stranded RNA	Togavirus (Rubivirus) enveloped, icosahedral, single-stranded RNA	Parvovirus, naked capsid, icosahedral, single-stranded DNA	Human herpesviruses 6 or 7, enveloped, icosahedral, double-stranded DNA
Transmission	Respiratory	Respiratory	Respiratory	Respiratory	Oral secretions
Incubation period (days)	12-29 (average 16-18)	7-18 (average 9-11)	14-21 (average 16)	4-12	Unknown
Symptoms	Fever, parotitis	Fever, cough, conjunctivitis, Koplik spots	Fever (low grade), upper respiratory symptoms	Mild fever, malaise, headache, myalgia, itching	High fever, occasional late sudden rash
Characteristic rash	None	Widespread, maculopapular	Faint, macular	Macular, reticular, often faint	Transient, faint macular
Duration of illness	7-10 days	3-5 days	1-3 days	1-2 weeks	3-5 days
Severity and/or complications	Meningitis, encephalitis, pancreatitis, orchitis, oophoritis	Bacterial superinfection, encephalitis, keratitis, reactivation of tuberculosis, subacute sclerosing panencephalitis (rare)	Overt arthritis Congenital infection	Aplastic crisis (in chronic[a] hemolytic diseases), arthritis, arthralgias	
Fetal infection	No[a]	No[a]	Yes—multiple defects	Yes—stillbirth, fetal hydrops	No[a]
Vaccine	Live attenuated	Live attenuated	Live attenuated	No	No

[a] Fetal infection may rarely occur, but with no apparent consequences.

741. A 50 years old man develops profuse watery diarrhea and severe dehydration. He continues to have loose watery stools despite not eating anything. Stool analysis revealed few pus cells , small amount of mucus and no blood.

A . Staphylococcus aureus
B . Vibrio Cholerae
C . E coli
D . Enterococcus faecalis
E . Salmonella
Key: b

742. A PG trainee of Virology department is conducting research on virus life cycle. He takes the bovine kidney fibroblasts , remove their nuclei and injects various viruses to see the cytopathic effects. Which virus has this effect?

A . Influenza virus
B . CMV Virus
C . Poliovirus
D . Adenovirus
E . Rubella virus

Key:c

(The experiment involves removing the nuclei from bovine kidney fibroblasts and then injecting various viruses to observe cytopathic effects. This setup suggests we are looking for a virus that can replicate and cause cytopathic effects in the absence of a host nucleus, indicating the virus likely replicates in the cytoplasm.

Poliovirus, a **positive-sense RNA virus**, can cause cytopathic effects in **fibroblasts** even in the absence of the host cell's nuclei. This is because poliovirus replicates entirely in the **cytoplasm** of the host cell, hijacking the host's cellular machinery for its replication without needing the nucleus.)

Also remember

- **All DNA viruses replicate in the nucleus EXCEPT Poxvirus (pox is out of the box)**
- **All RNA viruses replicate in the cytoplasm EXCEPT Influenza virus and Retrovirus (HIV/HTLV)**

743. A 45 years old male from bone marrow transplant centre who has recently undergone bone marrow transplant procedure , develops Diarrhea and fever. Acid fast staining of stool reveals thick walled oval structures of 4-6 microns in size.

A . Listeria
B . Salmonella
C . Cryptosporidium
D .E. Coli
E . Adenovirus
Key: c

744. A 25 years old pregnant female in her 3rd trimester of pregnancy develops fever, diarrhea and myalgias. She is a cheese lover and likes to eat cheese and cheese containing foods. Later on she gives birth to a baby boy at 36 weeks of gestation. Examination of the neonate reveals disseminated granulomas.

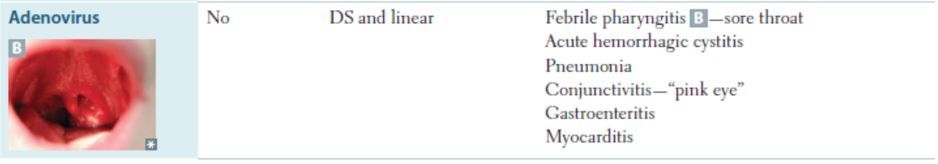
A . E coli
B . Streptococcus agalactiae
C . Neisseria gonorrhoeae
D . Listeria monocytogenes
E . Mycobacterium tuberculosis
Key: d

745. A 55 years old man is a patient of colorectal carcinoma. He presents with fever, generalized weakness and myalgias. Physical examination reveals hemorrhages under finger nails and murmur on auscultation of chest.

A . Streptococcus pneumoniae
B . Streptococcus bovis
C . Streptococcus agalactiae
D . Streptococcus mutans
E . Streptococcus pyogenes
Key: b

746. A 10 years old boy who is attending a summer camp with swimming activities presents with fever, malaise , sore throat and keratoconjunctivitis. They give the history that about 50% children of the camp have developed similar symptoms.

A . Neisseria spp
B . Herpesvirus
C . Adenovirus
D . Polio virus
E . Pseudomonas
Key: c



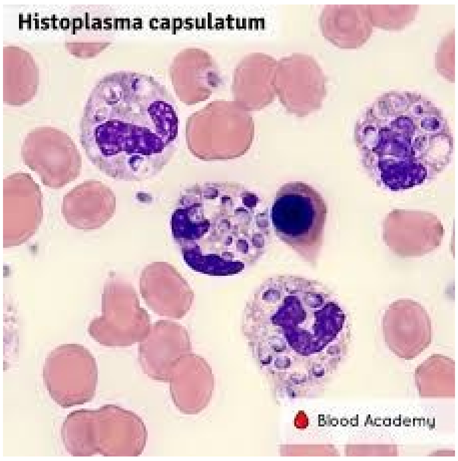
Adenovirus B	No	DS and linear	Febrile pharyngitis B—sore throat Acute hemorrhagic cystitis Pneumonia Conjunctivitis—"pink eye" Gastroenteritis Myocarditis

747. A 2 years old child presents with severe abdominal pain , fever , loose stools with pus, mucous and blood. His mother is a nurse by profession and child stays at day care center during her working hours with other children and attendant. Which one is responsible

A . E. coli
B . Salmonella typhi
C . Shigella sonnei
D . Vibrio cholerae
E . Yersinia pestis
Key: c

748. A 45 years old patient of CLL on chemotherapy presents with disseminated histoplasmosis. The family and staff were concerned about the spread of infections to others. However, when Microbiologist was approached for guidance he explained that the organism does not have person to person transmission because of

A . Hyphae
B . Microconidia
C . Macroconidia
D . Intracellular bodies
E . Budding Yeasts
Key: d



749. A 45 years old male develops progressive pain in ankles, knees, wrist and hands for the last 5 days. He gives the history that he suffered from such episodes 3 times in the past aswell. On examination he is febrile and there is diffuse petechial rash on trunk and extensor surfaces. The effected joints are swollen , tender and shows restricted movements. Blood cultures did not yield any growth however, joint fluid examination shows raised WBCs count.

A . Salmonella typhi
B . Yersinia pestis
C . Neisseria gonorrhoeae
D . Brucella abortus
E . Campylobacter jejuni
Key: c

Neisseria gonorrhoeae can cause disseminated gonococcal infection (DGI), which typically presents with arthritis, fever, rash, and tenosynovitis. The arthritis in DGI often affects multiple joints, such as the ankles, wrists, and knees, similar to what is described in the case. It commonly affects young, sexually active individuals and can lead to recurrent or progressive episodes, as seen in the history here.

Campylobacter can indeed trigger reactive arthritis (Reiter's Syndrome = Uveitis, arthritis, urethritis) after an enteric infection, but the presentation of sepsis-like symptoms, petechial rash, and joint involvement in the absence of gastrointestinal symptoms (or a history of diarrhea) makes it less likely in this case.

750. A 50 years old female develops the discoloration of her toenail. On examination its seen that the nails are fragile and there is a accumulation of hyperkeratotic debris under the effected part of the nail. What is the best treatment option

A . Nystatin
B . Fluconazole
C . Griseofulvin
D . Terbinafine
E . Amphotericin B
Key: d

gsk
Lamisil Cream 1%
Lamisil Cream 1%
(Terbinafine HCl)
10 grams
Broad-spectrum
Antifungal
For batch and expiry see end of the tube.
لیمسل کریم 1%
Composition: 1 gm cream contains:

751. A 35 years old fisherman from Baluchistan comes to physician with the complaints of chronic diarrhea, abdominal cramps and fatigue. His Laboratory investigations revealed low hemoglobin with macrocytic RBCs .

A. Taenia saginata
B. Taenia solium
C. Schistosoma haematobium
D. Clonorchis sinensis
E. Diphyllobothrium latum

Key: e

- **Helminth with macrocytic anemia / B12 deficiency anemia as a complication = D. latum (fish tapeworm)**
- **Helminth with microcytic hypochromic anemia as a complication = Ancylostoma (hookworm)**

752. An Outbreak of hepatitis is reported in village of Sind with 20 deaths. Once the outbreak investigation team conducted the investigation one of the finding was that the mortality was high amongst the pregnant females.
A. Hepatitis B
B. Hepatitis C
C. Hepatitis E
D. Adenovirus
E. Hepatitis D
Key: c

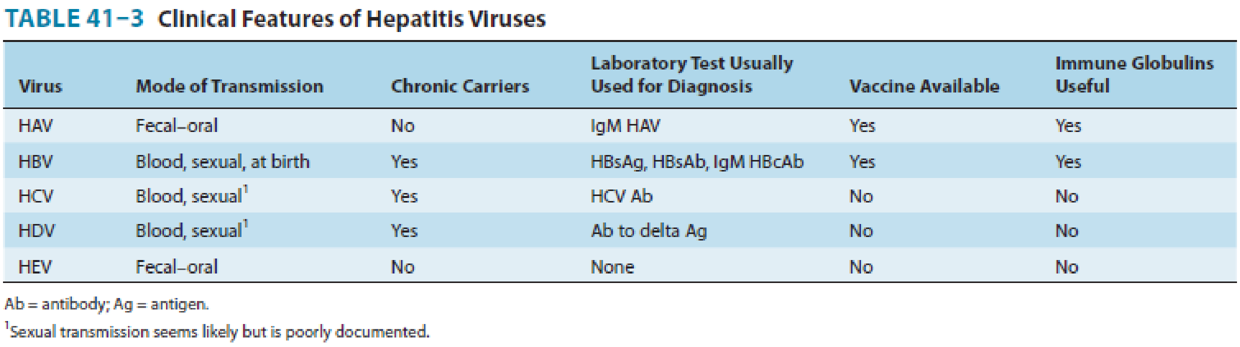


TABLE 41–3 Clinical Features of Hepatitis Viruses

Virus	Mode of Transmission	Chronic Carriers	Laboratory Test Usually Used for Diagnosis	Vaccine Available	Immune Globulins Useful
HAV	Fecal–oral	No	IgM HAV	Yes	Yes
HBV	Blood, sexual, at birth	Yes	HBsAg, HBsAb, IgM HBcAb	Yes	Yes
HCV	Blood, sexual[1]	Yes	HCV Ab	No	No
HDV	Blood, sexual[1]	Yes	Ab to delta Ag	No	No
HEV	Fecal–oral	No	None	No	No

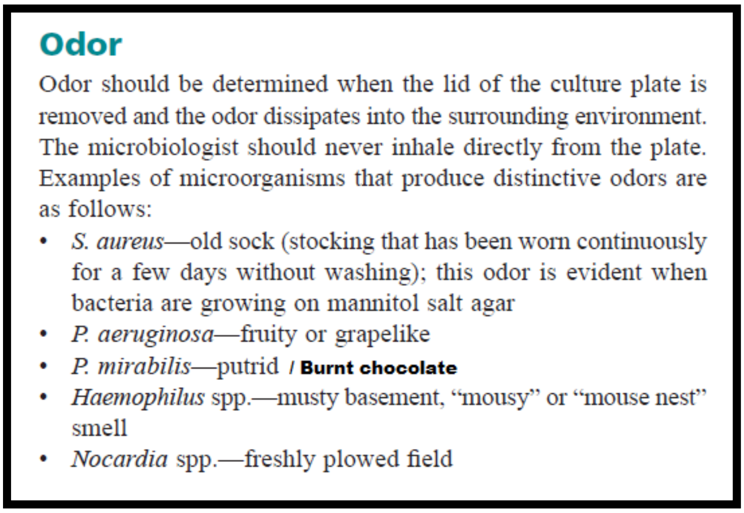
Ab = antibody; Ag = antigen.

[1] Sexual transmission seems likely but is poorly documented.

753. A 40-year-old female presented to outdoor with history of burning micturition along with frequency and urgency. Her urine routine examination was ordered. On urine routine examination Protein ++ and numerous pus cells were reported. Urine culture and sensitivity was ordered by the clinician. After 24 hours of incubation growth was seen on blood agar and MacConkey agar. The colonies gave 'burnt chocolate' smell on blood agar. What will be the most likely organism for the cause of her UTI?

a) Escherichia coli
b) Klebsiella pneumoniae
c) Proteus mirabilis
d) Pseudomonas aeruginosa
e) Providencia rettgeri

Key: C



Odor

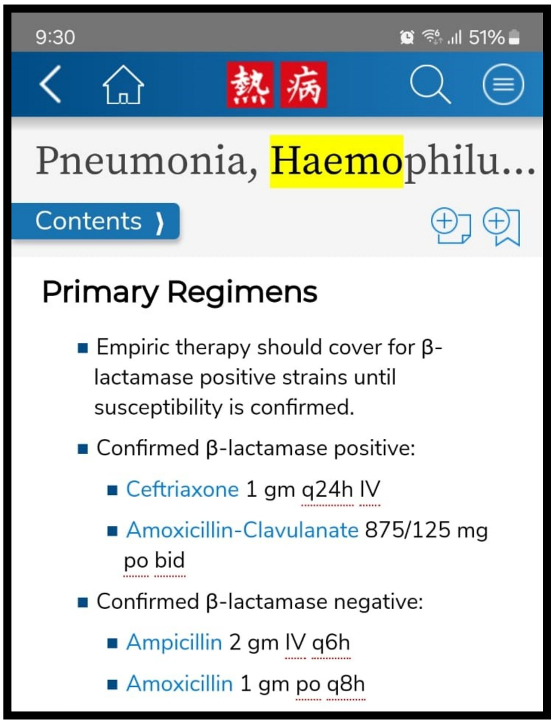
Odor should be determined when the lid of the culture plate is removed and the odor dissipates into the surrounding environment. The microbiologist should never inhale directly from the plate. Examples of microorganisms that produce distinctive odors are as follows:

- *S. aureus*—old sock (stocking that has been worn continuously for a few days without washing); this odor is evident when bacteria are growing on mannitol salt agar
- *P. aeruginosa*—fruity or grapelike
- *P. mirabilis*—putrid **/ Burnt chocolate**
- *Haemophilus* spp.—musty basement, "mousy" or "mouse nest" smell
- *Nocardia* spp.—freshly plowed field

754. A 2-year-old girl developed neck stiffness and severe headache. Due to high grade fever and other meningeal sign and symptoms, she was admitted in hospital. Her CSF showed clear picture of bacterial meningitis with raised protein concentration, decreased glucose level, and raised polymorphonuclear cell count. The culture of CSF yielded an organism which grew on Chocolate agar, not on Sheep blood agar and MacConkey agar suggesting growth of Hemophilus influenzae. Her therapy begun with 3rd generation cephalosporins. Why this therapy was given to her by the physicians instead of Ampicillin

a) The administration of 3rd generation cephalosporin is easy as compared to ampicillin.
b) The child can develop ampicillin allergy.
c) About 70% of Hemophilus influenzae have penicillin binding proteins that inhibit action of ampicillin.
d) The H. influenzae has plasmid mediated beta lactamases that is responsible for ampicillin resistance.
e) Ampicillin is not cost effective as compared to 3rd generation cephalosporins.

Key: D



Pneumonia, Haemophilu...

Primary Regimens

- Empiric therapy should cover for β-lactamase positive strains until susceptibility is confirmed.
- Confirmed β-lactamase positive:
  - Ceftriaxone 1 gm q24h IV
  - Amoxicillin-Clavulanate 875/125 mg po bid
- Confirmed β-lactamase negative:
  - Ampicillin 2 gm IV q6h
  - Amoxicillin 1 gm po q8h

755. A 35-year-old man came to emergency department because of scratch on leg while working on coastal area.His leg became swollen markedly within 1 hour and become red and painful. There was a discharge from the wound which showed serous secretion and after another hour bullae were also formed. What is the most likelycause of this necrotizing fasciitis?

a) Staphylococcus aureus
b) Streptococcus pyogenes
c) Clostridium perfringens
d) Pseudomonas aeruginosa
e) Vibrio vulnificus

Key: E

756. A 25-year-old girl came back from recreational trip from Turkey. She presented to emergency with complaint of severe abdominal pain and initially watery diarrhea. Later she developed blood-tinged stools. After inquiring from her she talked about cruise ship travelling at turkey. What will be the most likely organism causing bloody diarrhea?

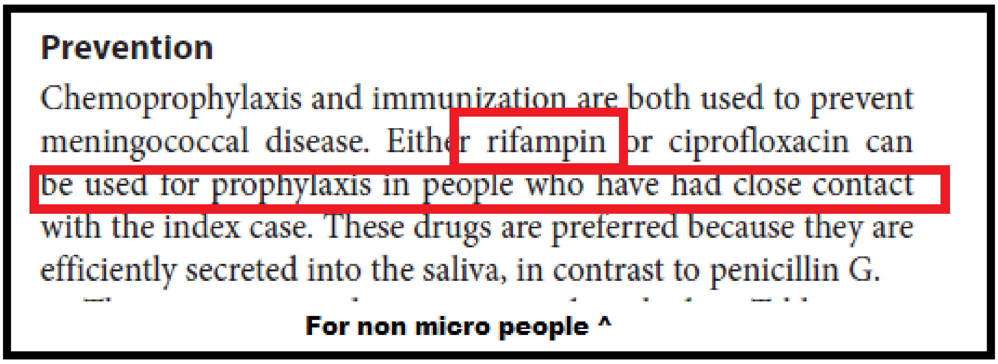
a) Campylobacter
b) E. coli
c) Salmonella
d) Shigella
e) Yersinia

Key: D

757. A 6-year-old boy taken to the emergency department, with complaint of fever and headache. On physical examination, neck stiffness was present, which suggests meningeal irritation. CSF culture was performed, growth of Neisseria meningitidis results. Which of the following steps should be most effective for his family members?

a) No prophylaxis or other steps are necessary.
b) They should be given N meningitidis pilin vaccine.
c) They should be given N meningitidis polysaccharide capsule vaccine.
d) They should be given rifampin prophylaxis.
e) They should be given sulfonamide prophylaxis.

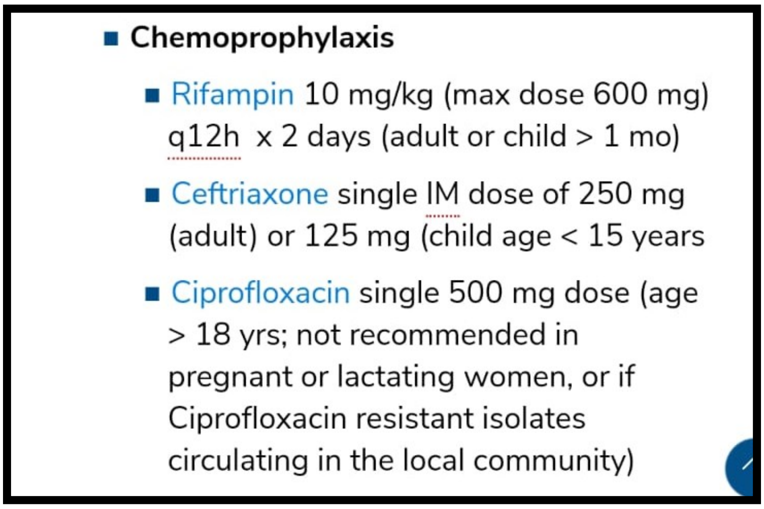
Key: D



Prevention

Chemoprophylaxis and immunization are both used to prevent meningococcal disease. Either rifampin or ciprofloxacin can be used for prophylaxis in people who have had close contact with the index case. These drugs are preferred because they are efficiently secreted into the saliva, in contrast to penicillin G.

For non micro people ^

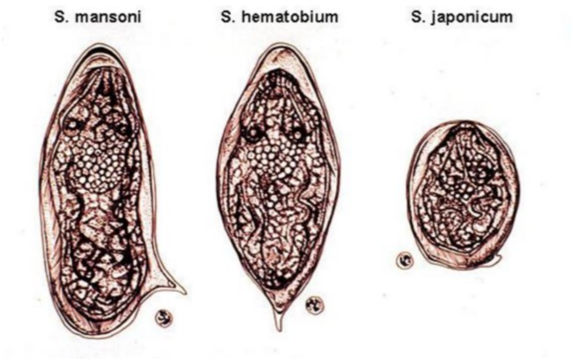


- **Chemoprophylaxis**
  - Rifampin 10 mg/kg (max dose 600 mg) q12h x 2 days (adult or child > 1 mo)
  - Ceftriaxone single IM dose of 250 mg (adult) or 125 mg (child age < 15 years
  - Ciprofloxacin single 500 mg dose (age > 18 yrs; not recommended in pregnant or lactating women, or if Ciprofloxacin resistant isolates circulating in the local community)

758. A 32-year-old male tourist travelled to West Africa for 1 month, he swam in the Congo River during his trip. Two months after his return, he started to complain of intermittent lower abdominal pain with dysuria. On routine examination of urine revealed eggs of parasites with a terminal spine. What will be the most likely parasite responsible for the patient's symptoms?

a) Ascaris lumbricoides
b) Schistosoma mansoni
c) Schistosoma haematobium
d) Taenia solium
e) Toxoplasma gondii

Key: C

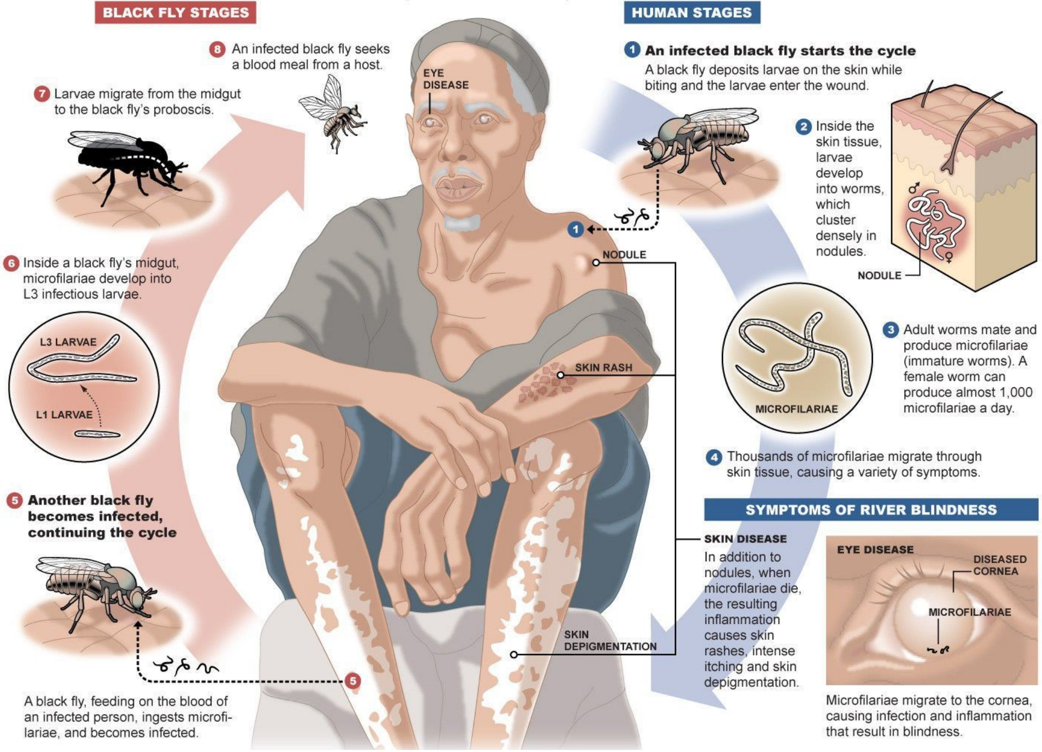


759. A 53-year old man from Sudan was taken to the hospital. He had history of 20 years of intensely pruritic skin, nodules on his rib cage and discoloration of some areas of his skin. Now he has an active complaint of progressive vision deterioration. What would be the most likely causative organism in this case?

a) Acanthamoeba
b) Loa Loa
c) Onchocerca volvulus
d) Toxocara Canis
e) Toxoplasma gondii

Key: C

The Life Cycle of River Blindness
(Onchocerciasis)



① **An infected black fly starts the cycle**
A black fly deposits larvae on the skin while biting and the larvae enter the wound.

② Inside the skin tissue, larvae develop into worms, which cluster densely in nodules.

③ Adult worms mate and produce microfilariae (immature worms). A female worm can produce almost 1,000 microfilariae a day.

④ Thousands of microfilariae migrate through skin tissue, causing a variety of symptoms.

⑤ **Another black fly becomes infected, continuing the cycle**

A black fly, feeding on the blood of an infected person, ingests microfilariae, and becomes infected.

⑥ Inside a black fly's midgut, microfilariae develop into L3 infectious larvae.

⑦ Larvae migrate from the midgut to the black fly's proboscis.

⑧ An infected black fly seeks a blood meal from a host.

SKIN DISEASE
In addition to nodules, when microfilariae die, the resulting inflammation causes skin rashes, intense itching and skin depigmentation.

Microfilariae migrate to the cornea, causing infection and inflammation that result in blindness.

760. An Asian woman aged 20-years-old, recently immigrated to USA. She develops productive cough of blood-tinged sputum and fever. She experienced remarkable weight loss in the past 2 months. Her chest X-ray revealed bilateral upper lobe infiltrates with cavities. Taking into account her chest x-ray results and history, which of the given drug treatment would be the most suitable in preliminary therapy while waiting for culture findings?

a) Ampicillin–sulbactam
b) Cefotaxime, clindamycin, and trimethoprim–sulfamethoxazole
c) Isoniazid, pyrazinamide, rifampin and ethambutol
d) Penicillin G and rifampin
e) Vancomycin, gentamicin, and clindamycin

Key: C

761. An old man aged 37 years having HIV antibody test positive and has a CD4 count of 50/µl. For two weeks, he had a fever of 102 ºF and feels lethargic. On physical examination, all the findings were normal. chest X-ray, urinalysis and complete blood cell count were also normal. Urine, blood and stool cultures showed no growth. Granulomas were revealed in a bone marrow biopsy and the culture had grown an organism that was a budding yeast at 37º C but produces hyphae at 25ºC. Which one of the following is the most likely cause?

a) Mucor species
b) Aspergillus fumigatus
c) Cryptococcus neoformans
d) Histoplasma capsulatum
e) Coccidioides immitis

Key: D

Given the bone marrow granulomas, granulomatous inflammation, low CD4 count, and the geographic context (Sudan), Histoplasma capsulatum is the more likely causative organism compared to Coccidioides immitis, which is typically associated with more pulmonary involvement and is not endemic in this region. Coccidioidomycosis, caused by *Coccidioides immitis* and *Coccidioides posadasii*, is most commonly found in the Southwestern United States and parts of Mexico and Central and South America.

762. A group of seven children less than 10 years of age live in South East Asia. All of them have multiple crusted weeping skin lesions of impetigo (pyoderma). The lesions involved mostly the areas of faces and arms. Which of the following microorganism is the most probable cause of these skin lesions?

a) Bacillus anthracis
b) Chlamydia trachomatis
c) Escherichia coli
d) Staphylococcus aureus
e) Streptococcus pneumoniae

Key: D

763. A 70-year-old woman suffered with dementia. Cortical atrophy was appreciated on her MRI scan. Her intraventricular pressure was very high and a ventriculo-peritoneal shunt was placed to relieve the pressure symptoms. After four weeks, she developed a fever to 40 ºC, loss of appetite and malaise but no other symptoms. Which one of the following organisms is responsible for her existing symptoms?

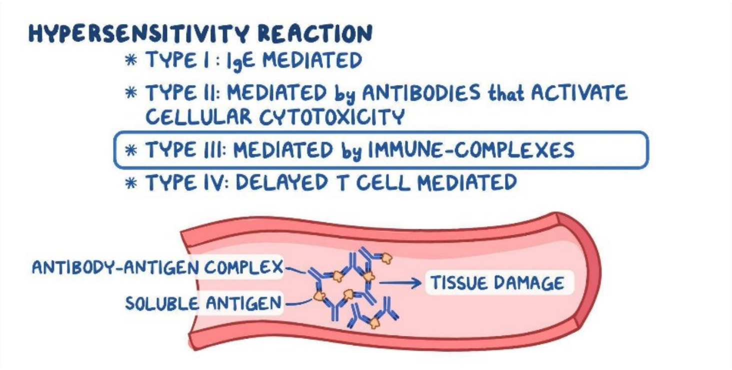
a) A gram-positive coccus that does not clot plasma
b) An obligate intracellular parasite that forms a cytoplasmic inclusion body
c) A curved gram-negative rod that produces urease
d) An acid-fast rod that does not grow on bacteriologic media
e) A spirochete that induces an antibody that agglutinates a lipid from a cow's heart

Key: A

764. A 50-year-old female has been treated for endocarditis with penicillin G for the last 15 days. Currently she has developed fever and maculopapular erythematous rash over her chest and abdomen. A complete urine examination showed remarkable proteins. If the rash, fever and protein in urine are immunologic in origin, amongst following which would be the most appropriate to be involved?

a) IgE and histamine
b) IgG and complement
c) Gamma interferon
d) IL-2 and cytotoxic T cells
e) Macrophages

Key: B


HYPERSENSITIVITY REACTION
* TYPE I : IgE MEDIATED
* TYPE II: MEDIATED by ANTIBODIES that ACTIVATE CELLULAR CYTOTOXICITY
* TYPE III: MEDIATED by IMMUNE-COMPLEXES
* TYPE IV: DELAYED T CELL MEDIATED
ANTIBODY-ANTIGEN COMPLEX
SOLUBLE ANTIGEN
TISSUE DAMAGE

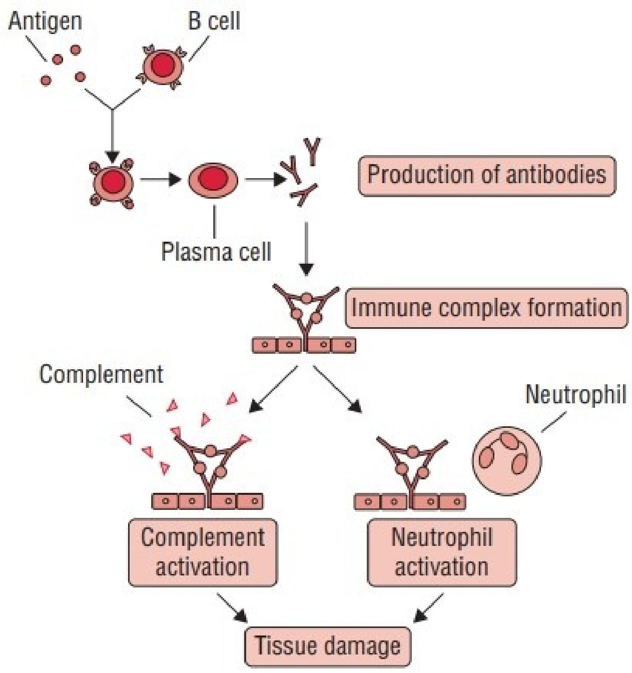
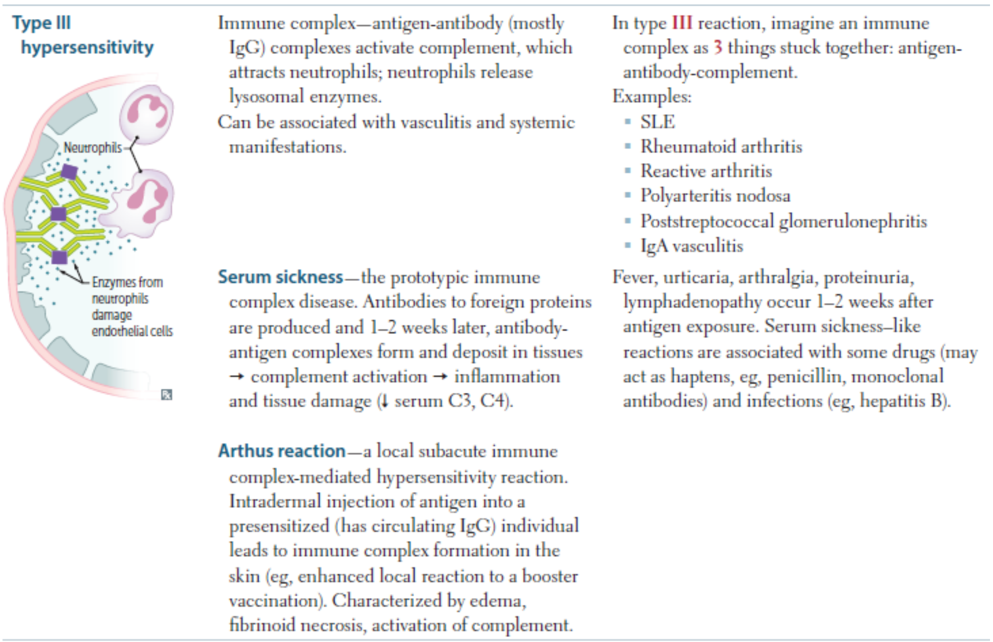


FIG. 19-3. A schematic diagram showing type III hypersensitivity reaction.

- **Serum sickness** is a classic example of an immunologic reaction caused by the deposition of **immune complexes** (antigen-antibody complexes) in tissues. This can be triggered by certain medications (like penicillin) or infections.
- In serum sickness, the body produces **IgG antibodies** in response to the foreign antigen (in this case, penicillin or its metabolites). These antibodies bind to the antigen and form **immune complexes**, which can deposit in tissues such as the skin, kidneys, and joints.
- Once these immune complexes are deposited, they activate the **complement system**, leading to **inflammation**, **fever**, **rash**, and **proteinuria** (protein in urine), which are all seen in the clinical scenario described in the question.


Neutrophils
Enzymes from neutrophils damage endothelial cells

Type III hypersensitivity	Immune complex—antigen-antibody (mostly IgG) complexes activate complement, which attracts neutrophils; neutrophils release lysosomal enzymes. Can be associated with vasculitis and systemic manifestations.	In type III reaction, imagine an immune complex as 3 things stuck together: antigen-antibody-complement. Examples: ▪ SLE ▪ Rheumatoid arthritis ▪ Reactive arthritis ▪ Polyarteritis nodosa ▪ Poststreptococcal glomerulonephritis ▪ IgA vasculitis
	Serum sickness—the prototypic immune complex disease. Antibodies to foreign proteins are produced and 1–2 weeks later, antibody-antigen complexes form and deposit in tissues → complement activation → inflammation and tissue damage (↓ serum C3, C4).	Fever, urticaria, arthralgia, proteinuria, lymphadenopathy occur 1–2 weeks after antigen exposure. Serum sickness–like reactions are associated with some drugs (may act as haptens, eg, penicillin, monoclonal antibodies) and infections (eg, hepatitis B).
	Arthus reaction—a local subacute immune complex-mediated hypersensitivity reaction. Intradermal injection of antigen into a presensitized (has circulating IgG) individual leads to immune complex formation in the skin (eg, enhanced local reaction to a booster vaccination). Characterized by edema, fibrinoid necrosis, activation of complement.	

A hapten is a small molecule that cannot trigger an immune response by itself. However, when it binds to a larger protein (called a carrier), it can form a complex that the immune system recognizes as foreign, triggering an immune response.

Penicillin is a good example of a hapten because it is a small molecule that by itself cannot provoke an immune response. However, when penicillin binds to proteins in the body (albumin/globulin), it forms a larger complex. This complex can be recognized by the immune system as foreign, potentially leading to an allergic reaction. The immune system then produces antibodies against the penicillin-protein complex, resulting in an allergic response.

765. A 60-year-old cancer patient who is getting chemotherapy for leukemia, has history of developing fever of 101 ºF with episode of rigors and chills and his blood pressure drops to 60/40 mmHg. Of the following factors, what can be causative for his fever, chills and hypotension?

Lipid A
Coagulase
Mycolic acid
Dipicolinic acid
Glycocalyx

Key: A

766. A 70-year-old female had surgery of adenocarcinoma of large intestine that was successfully removed. She did well 3 weeks after surgery when several blood transfusions were given, and then she developed fever, diarrhea and vomiting. Stool and blood culture did not reveal any bacteria. Tests for hepatitis B surface antigen and Clostridium difficile were also negative. A liver biopsy showed intranuclear inclusion bodies. Which one of the following is the most likely organisms?

a) Dengue virus
b) Rotavirus
c) Hepatitis A virus
d) Yellow fever virus
e) Cytomegalovirus

Key: E

- **Intranuclear inclusions = CMV and HSV**
- **Intracytoplasmic inclusions = Molluscum contagiosum and Rabies**

767. A 3-day old neonate presented to the emergency department with history of lethargy, poor feeding and irritability. His CSF culture is sent to the laboratory which yielded growth of Gram-negative bacilli after 48 hours of incubation. Which of the following virulence factors possessed by the bacteria?

A: Capsule production
B: Toxin production
C: Enzyme production
D: Biofilm formation
E: Outer membrane proteins
Key: a

** Enteropathogenic E. coli (EPEC):**
Cause of infantile diarrhea (especially in developing countries).

** Neonatal meningitis E. coli (NMEC):**
Cause of neonatal meningitis.
Associated with K1 capsular antigen.

** Enterotoxigenic E. coli (ETEC):**
Major cause of traveler's diarrhea.
Produces heat-labile toxin (LT) and heat-stable toxin (ST).
Causes watery diarrhea (not bloody).
Transmitted via contaminated water and food.

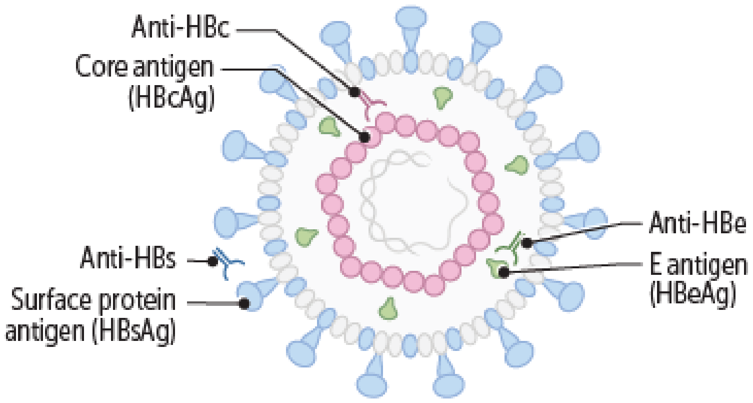
** Enterohemorrhagic E. coli (EHEC):**
Associated with bloody diarrhea and hemorrhagic colitis.
Can lead to hemolytic uremic syndrome (HUS).
Often caused by Shiga toxins (Stx1 and Stx2).
Common source: undercooked ground beef (especially O157:H7 strain). SMAC will appear as NLF

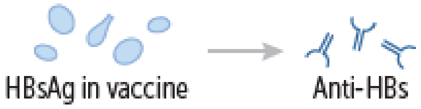
** Enter invasive E. coli (EIEC):**
Causes dysentery (bloody diarrhea with fever).
Invades and destroys colonic epithelial cells.
Similar to Shigella in terms of pathogenicity.

768. A 25-year-old male avid swimmer in fresh water ponds presented to emergency department with history of high-grade fever, chills and severe myalgias for the past 2 weeks. On examination there was redness in both the eyes. He later developed acute renal failure on 2nd day post admission and had raised D-dimers and subsequently the patient died. The diagnosis of the infective agent could be made by using which of the following medias?

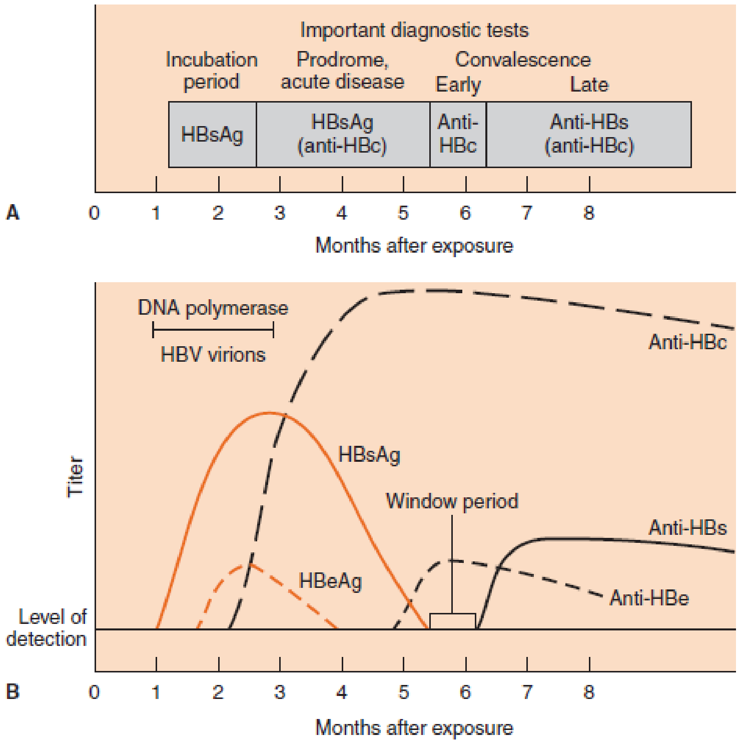
A: Chocolate agar
B: Modified Kelly Medium
C: Modified Thayer Martin Medium
D: Stuart Medium
E: Nelsons Medium
Key: CORRECTED = D Organism is leptospira

769. A 40-year-old nurse was recently diagnosed with Hepatitis B Virus following an accidental needle stick injury while sampling Hepatitis B Virus positive patient 6 months back.
Which one of the following tests will be positive in a window stage of HBV?
a) HBcAb
b) HBeAg
c) HBeAb
d) HbsAb
e) HBsAg
Ans: A


Anti-HBc
Core antigen
(HBcAg)
Anti-HBs
Surface protein
antigen (HBsAg)
Anti-HBe
E antigen
(HBeAg)


HBsAg in vaccine
Anti-HBs

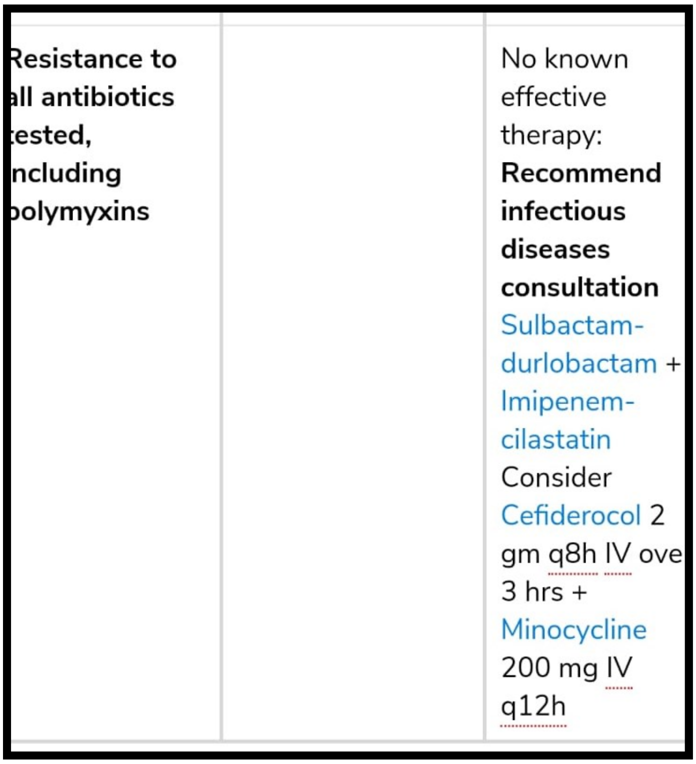
	HBsAg	Anti-HBs	Anti-HBc	HBeAg	Anti-HBe
Incubation	+				
Acute infection	+		+ (IgM)	+	
Window			+ (IgM)		+
Recovery		+	+ (IgG)		+
Chronic infection (high infectivity)	+		+ (IgG)	+	
Chronic infection (low infectivity)	+		+ (IgG)		+
Immunized		+			



770. A 65-year-old man admitted in medical ICU with congestive heart failure being treated with carbapenem. On his 5th day of admission, he developed fever. His TLC and CRP became markedly raised. Blood culture yielded Acinetobacter baumanni resistant to carbapenem, colistin and aminoglycosides. What would be the possible treatment option for this patient?

a) Cefiderocol
b) Ceftaroline
c) Fosfomycin
d) Linezolid
e) Vancomycin

Key A

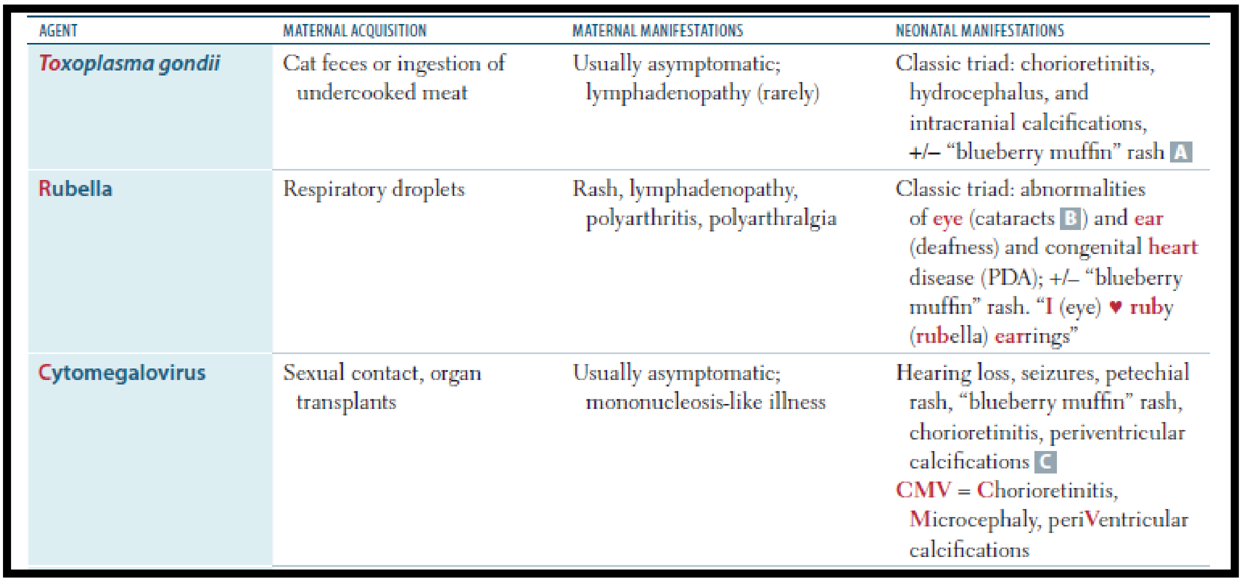


Resistance to ll antibiotics ested, ncluding olymyxins		No known effective therapy: **Recommend infectious diseases consultation** Sulbactam-durlobactam + Imipenem-cilastatin Consider Cefiderocol 2 gm q8h IV ove 3 hrs + Minocycline 200 mg IV q12h

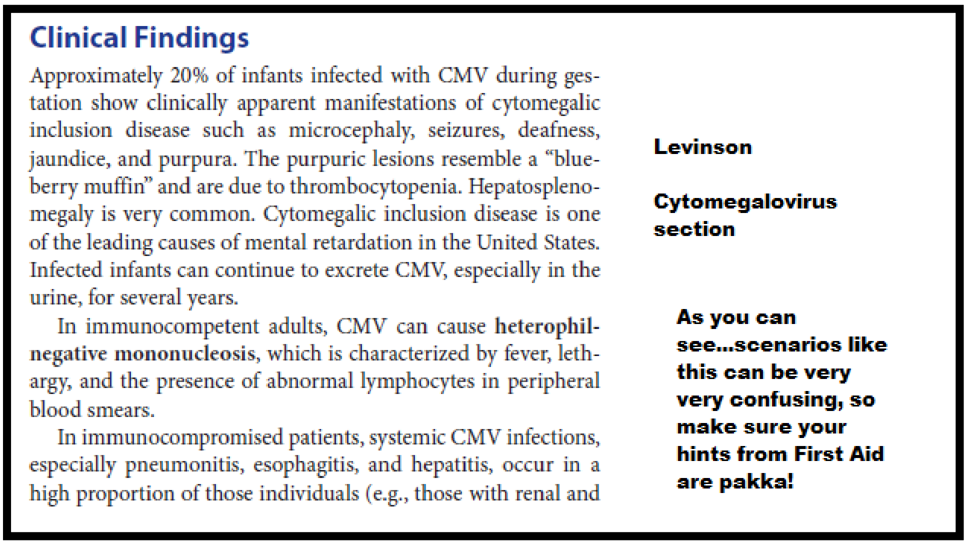
771. A baby born at 36 weeks of gestation presented with petechial rash, low birthweight, hepatosplenomegaly and bilateral cataracts. The immune status of mother was unknown. The attending pediatrician suspected an intrauterine infection. What could be the possible pathogen causing such illness?

a) Cytomegalovirus
b) Group B streptococcus
c) Rubella Virus
d) Toxoplasma gondii
e) Treponema pallidum

Key c



AGENT	MATERNAL ACQUISITION	MATERNAL MANIFESTATIONS	NEONATAL MANIFESTATIONS
Toxoplasma gondii	Cat feces or ingestion of undercooked meat	Usually asymptomatic; lymphadenopathy (rarely)	Classic triad: chorioretinitis, hydrocephalus, and intracranial calcifications, +/– "blueberry muffin" rash A
Rubella	Respiratory droplets	Rash, lymphadenopathy, polyarthritis, polyarthralgia	Classic triad: abnormalities of eye (cataracts B) and ear (deafness) and congenital heart disease (PDA); +/– "blueberry muffin" rash. "**I** (eye) ♥ **ruby** (rubella) earrings"
Cytomegalovirus	Sexual contact, organ transplants	Usually asymptomatic; mononucleosis-like illness	Hearing loss, seizures, petechial rash, "blueberry muffin" rash, chorioretinitis, periventricular calcifications C CMV = Chorioretinitis, Microcephaly, periVentricular calcifications



Clinical Findings

Approximately 20% of infants infected with CMV during gestation show clinically apparent manifestations of cytomegalic inclusion disease such as microcephaly, seizures, deafness, jaundice, and purpura. The purpuric lesions resemble a "blueberry muffin" and are due to thrombocytopenia. Hepatosplenomegaly is very common. Cytomegalic inclusion disease is one of the leading causes of mental retardation in the United States. Infected infants can continue to excrete CMV, especially in the urine, for several years.

In immunocompetent adults, CMV can cause **heterophil-negative mononucleosis**, which is characterized by fever, lethargy, and the presence of abnormal lymphocytes in peripheral blood smears.

In immunocompromised patients, systemic CMV infections, especially pneumonitis, esophagitis, and hepatitis, occur in a high proportion of those individuals (e.g., those with renal and

Levinson

Cytomegalovirus section

As you can see...scenarios like this can be very very confusing, so make sure your hints from First Aid are pakka!

772. A 50-year-old diabetic patient had an MRI brain and paranasal sinuses, in which he had lesions in maxillary sinus and been involved of blood supply of brain. Microscopic examination of tissue biopsy showed non-septate broad, irregular hyphae. On Lactophenol cotton blue staining colonies showed spores within sporangium on sporangiophore and roots like structures. Name the causative fungus.

a) Aspergillus niger
b) Curvularia lunata
c) Exophiala dermatitidis
d) Mucor azygosporus
e) Rhizopus arrhizus

Key: E

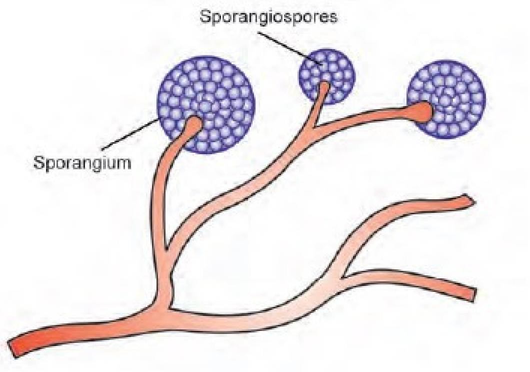


Fig. 26.2. Non-septate hyphae, branched sporangiophores with columellae and sporangia of *Mucor* species.

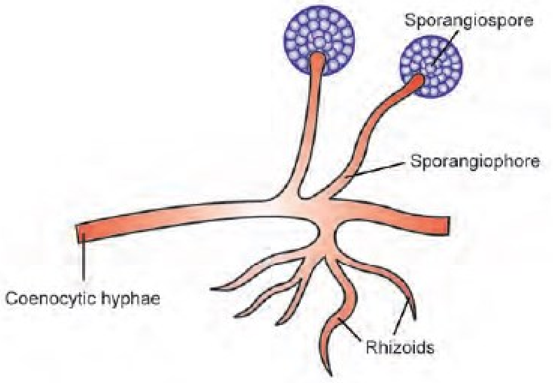


Fig. 26.3. Non-septate hyphae with rhizoids, sporangiophores and sporangia of *Rhizopus* species.

773. A 35-year-old man presents with multiple skin lesions on his left forearm. He had worked in a garment factory, where he sorted wool imported from another country. Physical examination shows an elevated cutaneous papule with bloody purulent exudate. There is prominent axillary lymphadenopathy. Pathogen responsible for patient’s necrotizing lesions is most likely to be

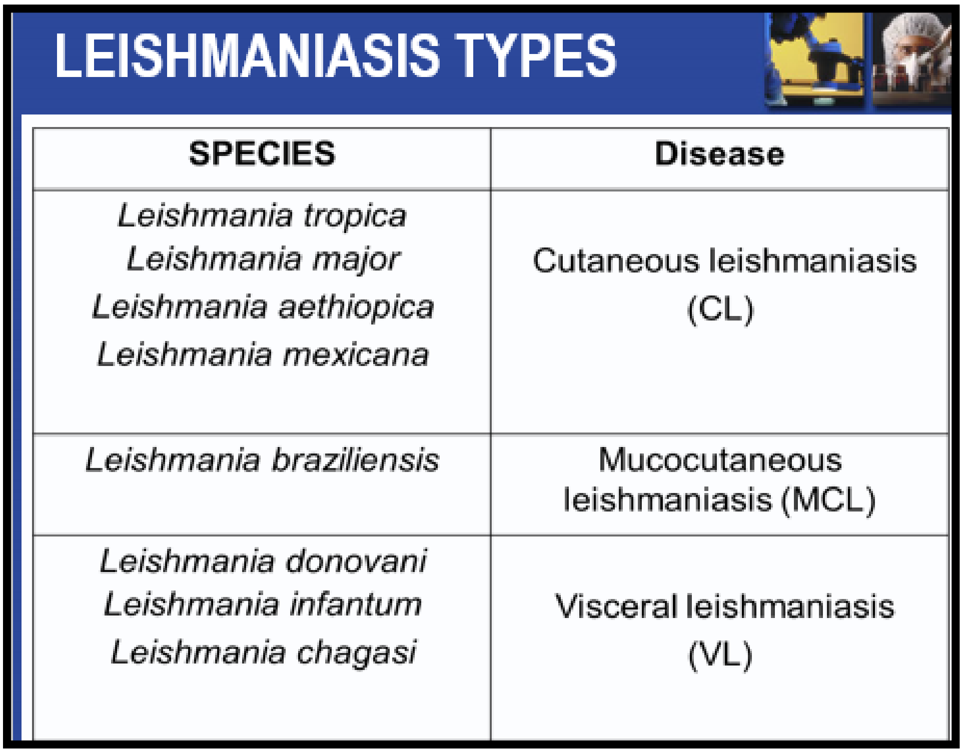
a) Bacillus anthracis
b) Streptococcus pyogenes
c) Staphylococcus aureus
d) Pseudomonas aeruginosa
e) Yersinia pestis

Key: A

774. A 25-year-old girl from Azad Kashmir presents at dermatology out door with history of a 4×2.5cm non healing ulcer on right cheek for the past 3 months. She has been to various doctors and prescribed antibiotic and steroids without any response. The dermatologist makes a slit skin smear from the ulcer edge and sends it to microbiology lab for examination. What diagnostic feature the microbiologist will look for?

a) Bacteria
b) Fungal ball
c) Granuloma
d) LD bodies
e) Polymorphonuclear cells

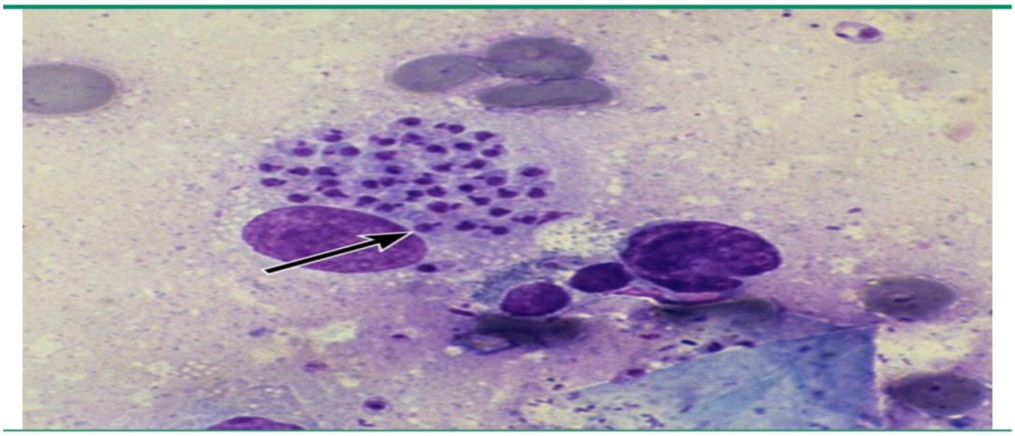
Key: D



LEISHMANIASIS TYPES

SPECIES	Disease
Leishmania tropica *Leishmania major* *Leishmania aethiopica* *Leishmania mexicana*	Cutaneous leishmaniasis (CL)
Leishmania braziliensis	Mucocutaneous leishmaniasis (MCL)
Leishmania donovani *Leishmania infantum* *Leishmania chagasi*	Visceral leishmaniasis (VL)

***Leishmania* amastigote**



Leishmania infected white blood cell on touch imprint, Giemsa stain, 250x magnification. The arrow shows an amastigote with the characteristic rod-shaped kinetoplast perpendicular to the nucleus.

775. A 5-year-old child presented with a 5-day history of fever. Fever was high grade and associated with malaise and loss of appetite. On blood culture growth of Salmonella typhi was isolated. What is the route of transmission of this organism?

a) Aerosol
b) Blood borne
c) Feco-oral
d) Poultry
e) Skin penetration

Key: C

776. A 65-year-old man admitted in ICU of a tertiary care hospital. He had high grade fever and not settling with empirical intravenous antibiotics. His blood culture was sent to microbiology laboratory. However, the old man died due to sudden drop of blood pressure on 3rd day of admission. Meanwhile his awaiting blood culture report came and showed Gram negative rods isolation by the microbiologist. What would be the factor responsible for the septic shock in this patient.

a) Capsular protein
b) Endotoxin
c) Peptidoglycan
d) Phospholipid
e) Teichoic acid

Key: B

777. A 45-year-old man working in a zoo. He was presented to outpatient department with high grade fever, malaise, cough, and breathlessness. His clinical examination showed features of atypical pneumonia. Sputum culture was sent but it came over as negative culture for any growth after 48 hours. What was the likely organism responsible for his pneumonia?

a) Chlamydia pneumoniae
b) Chlamydia psittaci
c) Chlamydia trachomatis
d) Mycoplasma pneumoniae
e) Klebsiella pneumoniae

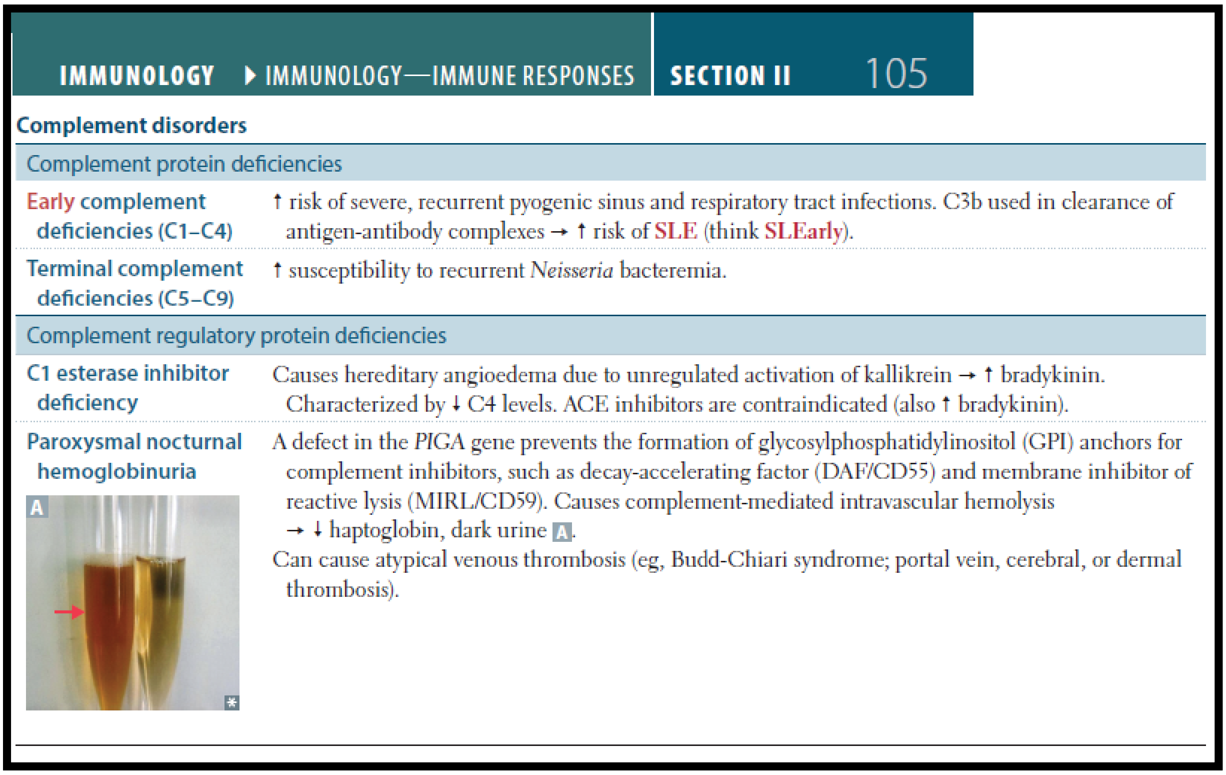
Key: b

778. 20 years old woman presented in ER complains of swellings on her arms and legs and feeling a fullness in her throat that makes her difficult to breathe. You suspect she may have angioedema caused by a complement abnormality. Of the following which one is the most likely explanation

a) She has too little C1 inhibitor
b) She has too little C3b
c) She has too much C5a
d) Aggregation of C4 and C2
e) She has too little membrane attack complex

Key: A

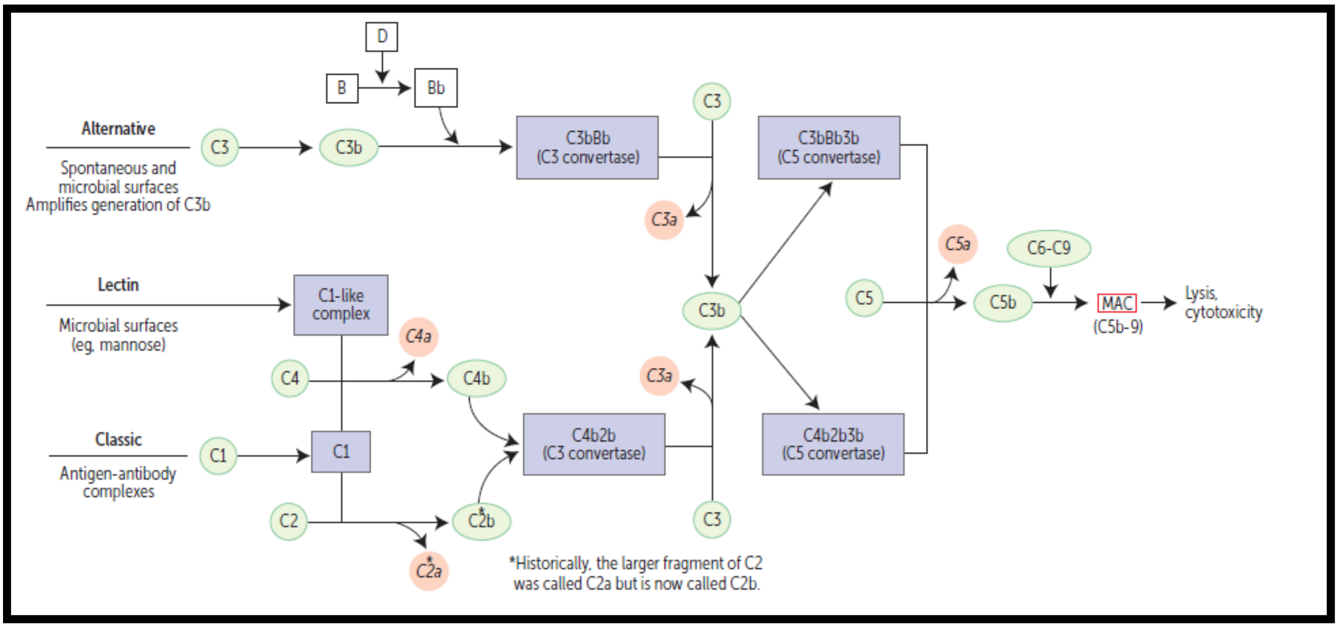
Hereditary angioedema (HAE), is caused by a deficiency or dysfunction of C1 inhibitor (C1-INH). C1-INH is a key regulator of the complement system, which helps prevent inappropriate activation of the complement cascade. When there is too little C1-INH, there is uncontrolled activation of the complement system and bradykinin, leading to increased vascular permeability and fluid leakage into tissues, which causes swelling (angioedema).

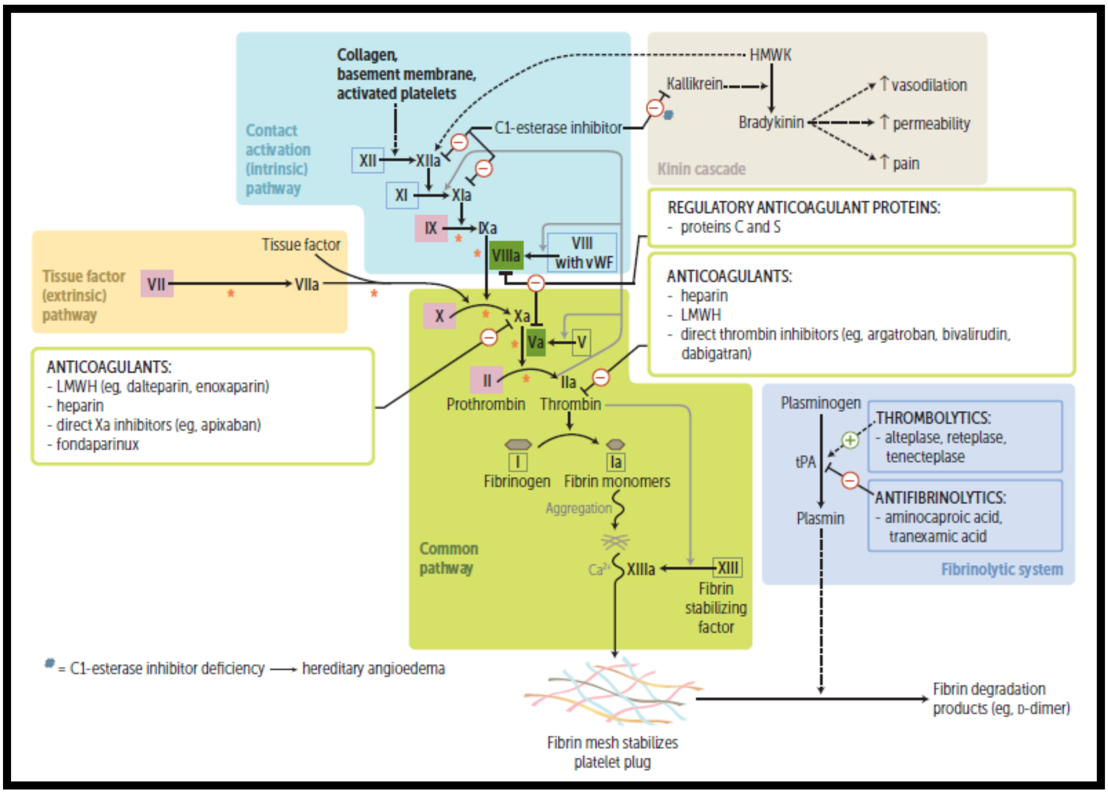


IMMUNOLOGY ▸ IMMUNOLOGY—IMMUNE RESPONSES SECTION II 105

Complement disorders

Complement protein deficiencies	
Early complement deficiencies (C1–C4)	↑ risk of severe, recurrent pyogenic sinus and respiratory tract infections. C3b used in clearance of antigen-antibody complexes → ↑ risk of SLE (think SLEarly).
Terminal complement deficiencies (C5–C9)	↑ susceptibility to recurrent *Neisseria* bacteremia.
Complement regulatory protein deficiencies	
C1 esterase inhibitor deficiency	Causes hereditary angioedema due to unregulated activation of kallikrein → ↑ bradykinin. Characterized by ↓ C4 levels. ACE inhibitors are contraindicated (also ↑ bradykinin).
Paroxysmal nocturnal hemoglobinuria A	A defect in the *PIGA* gene prevents the formation of glycosylphosphatidylinositol (GPI) anchors for complement inhibitors, such as decay-accelerating factor (DAF/CD55) and membrane inhibitor of reactive lysis (MIRL/CD59). Causes complement-mediated intravascular hemolysis → ↓ haptoglobin, dark urine A. Can cause atypical venous thrombosis (eg, Budd-Chiari syndrome; portal vein, cerebral, or dermal thrombosis).


D
B
Bb
Alternative
Spontaneous and microbial surfaces
Amplifies generation of C3b
C3
C3b
C3bBb (C3 convertase)
C3
C3a
C3bBb3b (C5 convertase)
Lectin
Microbial surfaces (eg, mannose)
C1-like complex
C4a
C4
C4b
C3b
C5a
C6-C9
C5
C5b
MAC (C5b-9)
Lysis, cytotoxicity
C3a
Classic
Antigen-antibody complexes
C1
C1
C4b2b (C3 convertase)
C4b2b3b (C5 convertase)
C2
C2b*
C3
C2a*
*Historically, the larger fragment of C2 was called C2a but is now called C2b.


Collagen, basement membrane, activated platelets
Contact activation (intrinsic) pathway
HMWK
Kallikrein
Bradykinin
↑ vasodilation
↑ permeability
↑ pain
Kinin cascade
C1-esterase inhibitor
XII → XIIa
XI → XIa
IX → IXa
VIIIa
VIII with vWF
Tissue factor
Tissue factor (extrinsic) pathway
VII → VIIa
X → Xa
Va ← V
II → IIa
Prothrombin
Thrombin
REGULATORY ANTICOAGULANT PROTEINS:
- proteins C and S
ANTICOAGULANTS:
- heparin
- LMWH
- direct thrombin inhibitors (eg, argatroban, bivalirudin, dabigatran)
ANTICOAGULANTS:
- LMWH (eg, dalteparin, enoxaparin)
- heparin
- direct Xa inhibitors (eg, apixaban)
- fondaparinux
I
Fibrinogen
Ia
Fibrin monomers
Aggregation
Common pathway
Ca2+ XIIIa ← XIII
Fibrin stabilizing factor
Plasminogen
tPA
Plasmin
THROMBOLYTICS:
- alteplase, reteplase, tenecteplase
ANTIFIBRINOLYTICS:
- aminocaproic acid, tranexamic acid
Fibrinolytic system
= C1-esterase inhibitor deficiency → hereditary angioedema
Fibrin mesh stabilizes platelet plug
Fibrin degradation products (eg, D-dimer)

779. A 65-year-old man developed an abscess at the back. The discharged pus is yellow granular in color. These lesions are like the lesions caused by Nocardia. What will be the management of this abscess?

a) Amphotericin B
b) Flucytosine.
c) Incision and drainage
d) Sulphonamides
e) Surgical excision

Key: D (S N A P)

780. A 18-year college scout got bat-bite while camping in northern areas. He was taken to the near-by hospital. Considering rabies prophylaxis what would be the best thing to do?

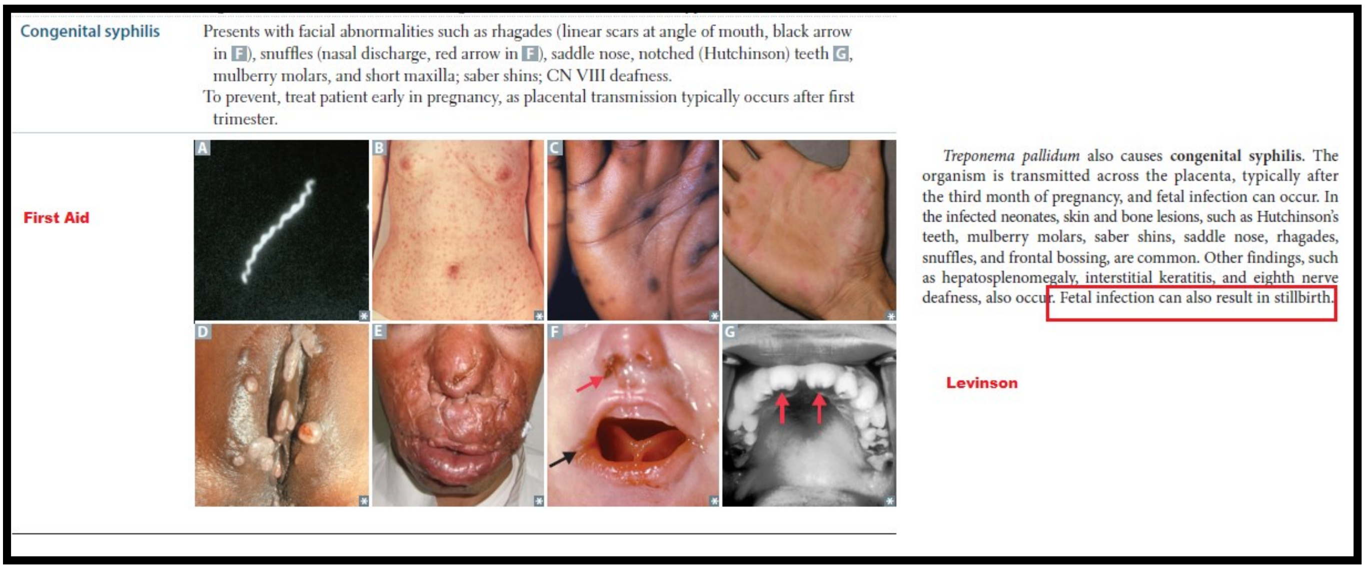
a) Begin prophylaxis immediately
b) No need of prophylaxis

c) Observe the patient for 10 days
d) Report to public health officials
e) Vaccinate the boy.

Key: A (Rabies vaccine PLUS rabies immunoglobulin dena hai – yaani passive-active immunization!)

781. A 35-year female sex worker presented to medical OPD with fever and multiple papulosquamous rash on palms of hands and soles on feet in her last trimester of pregnancy. What is the most common risk to newborn?
a) Aseptic meningitis
b) Body rash
c) Low birth weight
d) Liver malfunctioning
e) Still birth

Key: E



Congenital syphilis Presents with facial abnormalities such as rhagades (linear scars at angle of mouth, black arrow in F), snuffles (nasal discharge, red arrow in F), saddle nose, notched (Hutchinson) teeth G, mulberry molars, and short maxilla; saber shins; CN VIII deafness.
To prevent, treat patient early in pregnancy, as placental transmission typically occurs after first trimester.

First Aid

Treponema pallidum also causes **congenital syphilis.** The organism is transmitted across the placenta, typically after the third month of pregnancy, and fetal infection can occur. In the infected neonates, skin and bone lesions, such as Hutchinson's teeth, mulberry molars, saber shins, saddle nose, rhagades, snuffles, and frontal bossing, are common. Other findings, such as hepatosplenomegaly, interstitial keratitis, and eighth nerve deafness, also occur. Fetal infection can also result in stillbirth.

Levinson

782. A 14-year-old girl developed a rapidly spreading, painful, erythematous rash on her leg. On examination, the rash was warm and tender with presence of blood-filled ischemic bullae on skin. Gram stain of the aspirate from the rash showed gram-positive cocci in chains. What would be the most probable empiric treatment in this patient?
a) Ampicillin
b) Ceftriaxone
c) Carbapenems
d) Erythromycin
e) Vancomycin

Key: E

783. A 2-months-old infant with unknown vaccination history presented to emergency with fever, vomiting and the watery diarrhea for three days. The mother complained of sleeplessness, irritability and loss of appetite. The condition settled with supportive treatment without antibiotics. What could be the most common pathogen?
a) Vibrio cholera
b) Escherichia coli
c) Entamoeba histolytica
d) Giardia lamblia
e) Rota virus

Key: E

784. A 43-years old IV drug abuser presented with fever and headache followed by neck rigidity and altered sensorium. CSF routine analysis showed high protein and low glucose with predominant lymphocytes. Which one of the following test would be positive throughout the course of disease?

a) India ink staining
b) Gram staining
c) CSF culture
d) Antigen testing
e) PCR

Key: D (The organism is Cryptococcus neoformans!)

remel Cryptococcus Antigen Latex Test
50
R30851501
Protease Tablets
DANGER

785. A 14-year-old college student presented to medical OPD with high grade fever and abdominal pain for last three days. On examination, abdomen was tender with enlarged spleen. His complete blood count showed leukopenia. Blood culture yielded oxidase negative, non-lactose fermenting colonies with serrated margins producing H2S. What could be the most likely reservoir of infection?
a) Animals
b) Dairy products
c) Poultry
d) Human
e) Canned food

Key: D

Typhoid fever is primarily transmitted via the fecal-oral route, and human carriers of Salmonella typhi are the main reservoir.

786. A 35-year-old man admitted in surgical ICU with 2nd degree burns developed a greenish colored discharge from his wound after three days. Which one of the following is not a characteristic of the pathogen causing such infection?
a) Lactose non fermenter
b) Oxidase positive
c) Glucose fermenter
d) Pigment producer
e) Strict aerobe

Key: C

787. A 14-year-old girl developed a rapidly spreading, painful, erythematous rash on her leg. On examination, the rash was warm and tender. Aspirate from the rash was sent for microbiological culture which yielded β-hemolytic colonies on blood agar. Growth of the organism was inhibited by bacitracin. What could be the possible microorganism?
a) Corynebacterium species
b) Streptococcus pyogenes
c) Staphylococcus aureus
d) Pseudomonas aeruginosa
e) Proteus mirabilis

Key: B

788. In a recent outbreak in a childcare setting many children developed greasy and foul-smelling diarrhea with fever and abdominal pain. Majority of children had no vomiting and the diarrhea settled with supportive treatment without antibiotics. What could be the most likely organism causing such outbreak?

a) Vibrio cholera
b) Escherichia coli
c) Salmonella typhi
d) Entamoeba histolytica
e) Giardia lamblia

Key: E

789. A 60-years old AIDS patient recently developed meningitis. CSF was sent for microbiological examination in the laboratory. Gram stain showed yeast cells with narrow-necked budding. What could be the possible causative agent?

a) Candida albicans
b) Cryptococcus neoformans
c) Aspergillus fumigatus
d) Blastomyces dermatiditis
e) Histoplasma capsulatum

Key: B

- **HIV/AIDS walay main diarrhea = Cryptosporidium parvum**
- **HIV/AIDS walay main meningitis = Cryptococcus neoformans**
- **HIV/AIDS walay main pneumonia with ground glass appearance = Pneumocystis jiroveci/ carinii**

790. A 6-year-old school boy with uncertain vaccination history presented to medical OPD with high grade fever and unilateral swelling on left side of the jaw. The pain aggravated while chewing or swallowing. On examination,the swelling was tender. What would be the most likely cause of such illness?

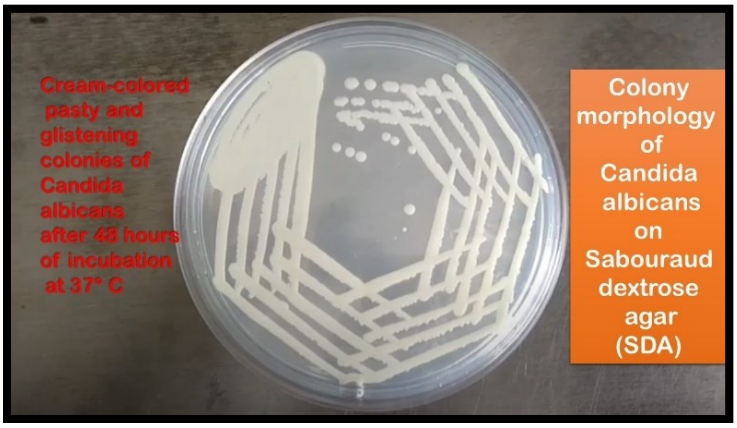
a) Measles
b) Rubella
c) Mumps
d) Adenovirus
e) Respiratory syncytial virus

Key: C

791. An infant was brought to emergency with the complains of crying and not taking any feed from last one day. On examination, the attending doctor found whitish lesions in the mouth and extensive diaper rash. Which of the following culture media is most suitable for the growth of the pathogen causing such illness?

a) Nutrient agar
b) MacConkey agar
c) Chocolate agar
d) Sabouraud agar
e) Blood agar

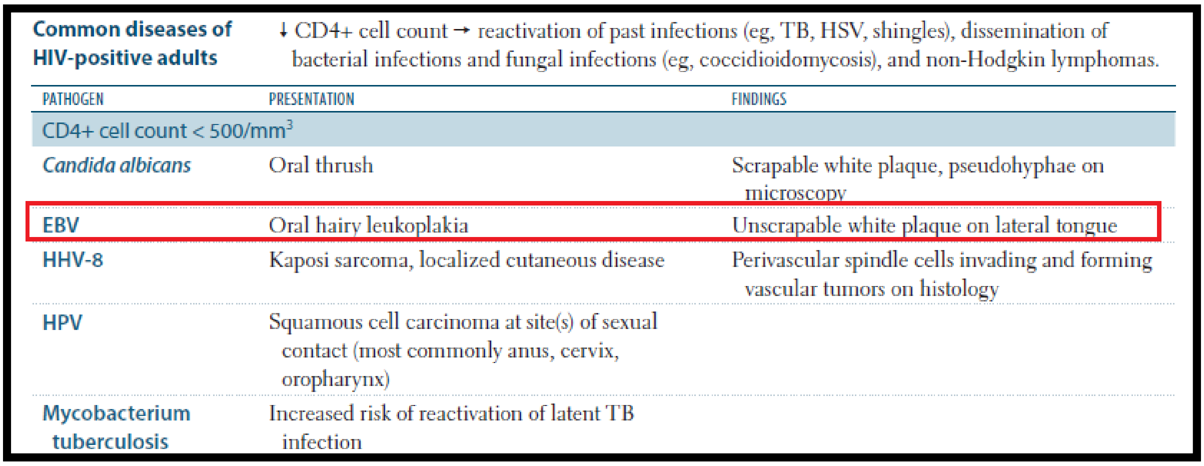
Key: D


Cream-colored pasty and glistening colonies of Candida albicans after 48 hours of incubation at 37° C
Colony morphology of Candida albicans on Sabouraud dextrose agar (SDA)

792. A 35-years HIV positive male presented in emergency with increased lethargy, fever and weight loss for last 2 months. He also complained of repeated sore throat and chest infections. On examination, there were enlarged lymph nodes along with whitish irregular hairy like lesion on lateral surface of the tongue. What could be the probable diagnosis on these clinical findings?

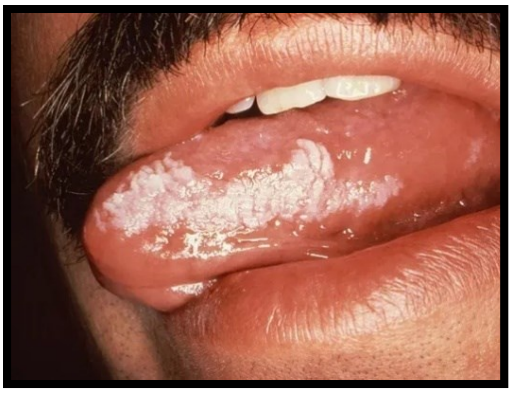
a) EBV
b) CMV
c) Papilloma virus
d) Adenovirus
e) RSV

Key: A



Common diseases of HIV-positive adults ↓ CD4+ cell count → reactivation of past infections (eg, TB, HSV, shingles), dissemination of bacterial infections and fungal infections (eg, coccidioidomycosis), and non-Hodgkin lymphomas.

PATHOGEN	PRESENTATION	FINDINGS
CD4+ cell count $< 500/mm^3$		
Candida albicans	Oral thrush	Scrapable white plaque, pseudohyphae on microscopy
EBV	Oral hairy leukoplakia	Unscrapable white plaque on lateral tongue
HHV-8	Kaposi sarcoma, localized cutaneous disease	Perivascular spindle cells invading and forming vascular tumors on histology
HPV	Squamous cell carcinoma at site(s) of sexual contact (most commonly anus, cervix, oropharynx)	
Mycobacterium tuberculosis	Increased risk of reactivation of latent TB infection	



793. A 55-years-old diabetic male presented to emergency with 102ºC fever, non-productive cough and extreme shortness of breath. He also complains of loss of taste and smell for a couple of days. On investigation, chest X-ray revealed bilateral infiltrates in lungs with negative bacterial culture. What could be the possible causative agent?

a) Influenza virus
b) Respiratory syncytial virus
c) Rhinovirus
d) Adenovirus
e) SARS CoV-2

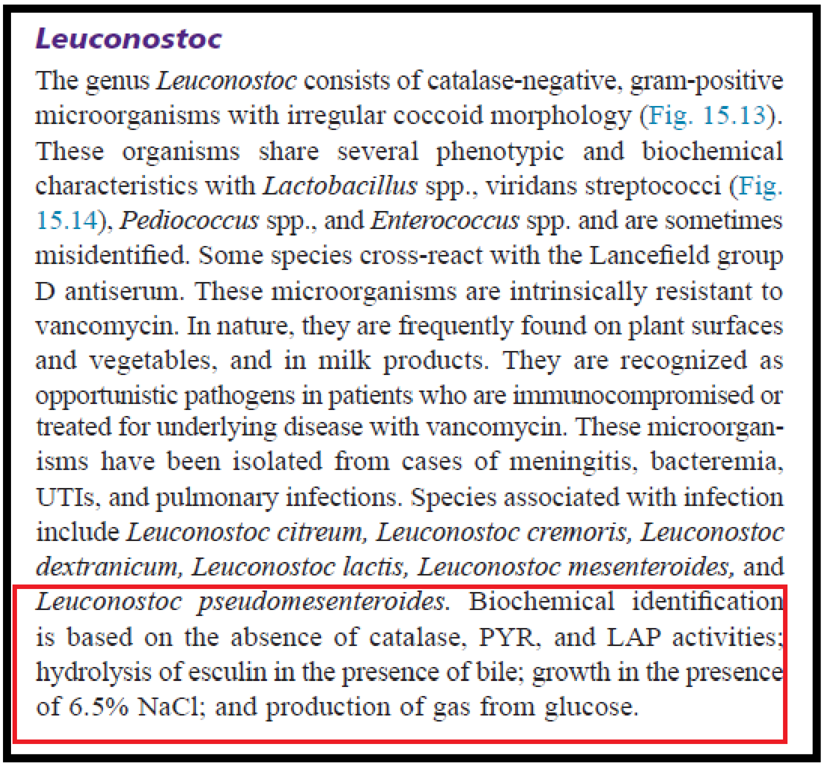
Key: E

794. A 59 year old female admitted in intensive care unit with history of fever and low blood pressure for past one week. The physician sent her blood sample for culture and sensitivity, which yield growth of Gram-positive cocci. Biochemical reaction showed absence of catalase ,,hydrolysis of esculin in presence of bile ,growth in presence of 6.5%NACL and production of gas from glucose.The organism was also resistant to vancomycin on AST. Depending upon the above characteristics the most likely organism responsible for causing bacteremia in this patient is

a) enterococcus casseliflavus
b) leuconostoc sp
c) aerococcus
d) pediococcus

e) lactococcus

Key: **b**



Leuconostoc

The genus *Leuconostoc* consists of catalase-negative, gram-positive microorganisms with irregular coccoid morphology (Fig. 15.13). These organisms share several phenotypic and biochemical characteristics with *Lactobacillus* spp., viridans streptococci (Fig. 15.14), *Pediococcus* spp., and *Enterococcus* spp. and are sometimes misidentified. Some species cross-react with the Lancefield group D antiserum. These microorganisms are intrinsically resistant to vancomycin. In nature, they are frequently found on plant surfaces and vegetables, and in milk products. They are recognized as opportunistic pathogens in patients who are immunocompromised or treated for underlying disease with vancomycin. These microorganisms have been isolated from cases of meningitis, bacteremia, UTIs, and pulmonary infections. Species associated with infection include *Leuconostoc citreum, Leuconostoc cremoris, Leuconostoc dextranicum, Leuconostoc lactis, Leuconostoc mesenteroides,* and *Leuconostoc pseudomesenteroides.* Biochemical identification is based on the absence of catalase, PYR, and LAP activities; hydrolysis of esculin in the presence of bile; growth in the presence of 6.5% NaCl; and production of gas from glucose.

For micro people:

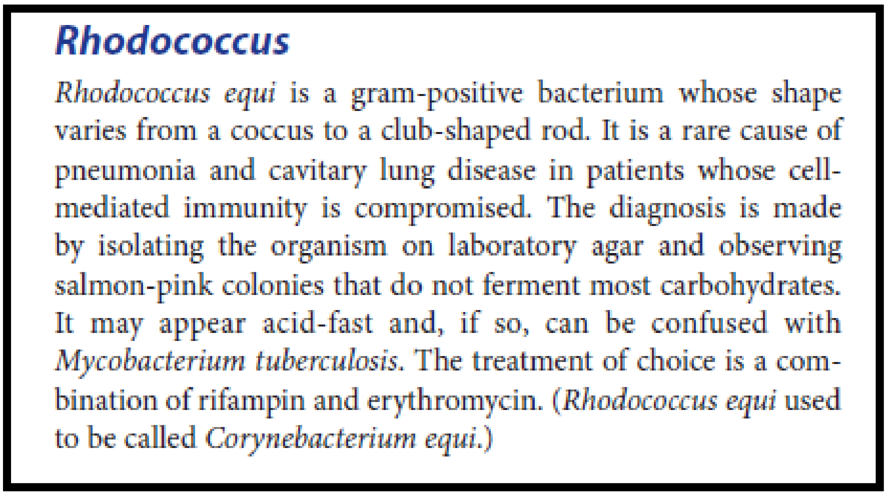
Gram-positive organisms that are intrinsically resistant to vancomycin:

- Leuconostoc species
- Pediococcus species
- Lactobacillus species
- Erysipelothrix rhusiopathiae

795. A 40 year old male known case of HIV complaint of having fever, labored breathing, and cough .His X ray chest showed cavitary lung lesion. Bronchoalveolar lavage was sent to the microbiology lab and showed growth of salmon pink colored colonies on SBA..Gram staining of the organism showed gram positive diphtheroid like rods with partial acid fast properties. Choose the best identification of the organism in this case.

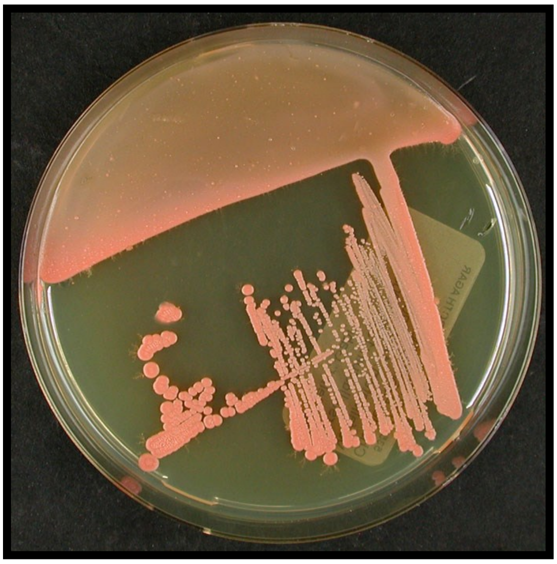
A. RHODOCOCCUS EQUI
B.NOCARDIA ASTERIODES
C.ACTINOMADURA
D.STREPTOMYCES
E.GORDONIA

Key: A



Rhodococcus

Rhodococcus equi is a gram-positive bacterium whose shape varies from a coccus to a club-shaped rod. It is a rare cause of pneumonia and cavitary lung disease in patients whose cell-mediated immunity is compromised. The diagnosis is made by isolating the organism on laboratory agar and observing salmon-pink colonies that do not ferment most carbohydrates. It may appear acid-fast and, if so, can be confused with *Mycobacterium tuberculosis*. The treatment of choice is a combination of rifampin and erythromycin. (*Rhodococcus equi* used to be called *Corynebacterium equi*.)



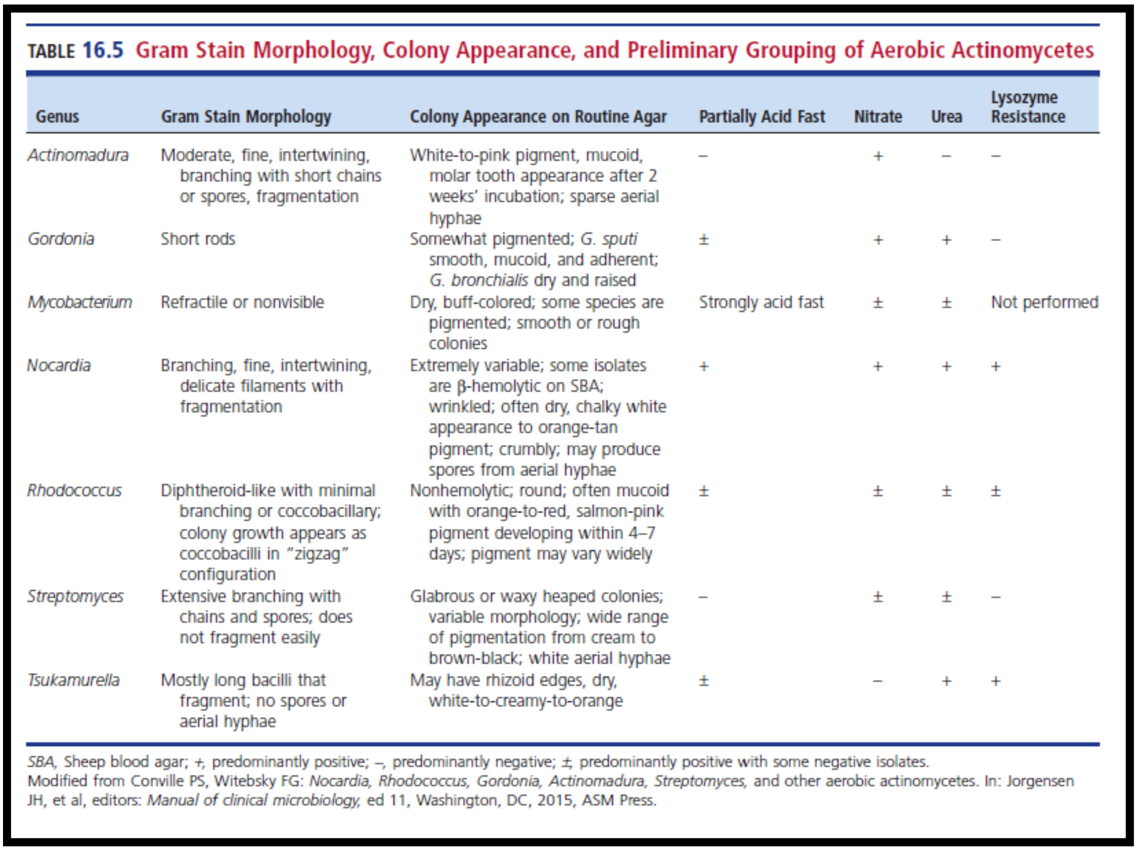


TABLE 16.5 Gram Stain Morphology, Colony Appearance, and Preliminary Grouping of Aerobic Actinomycetes

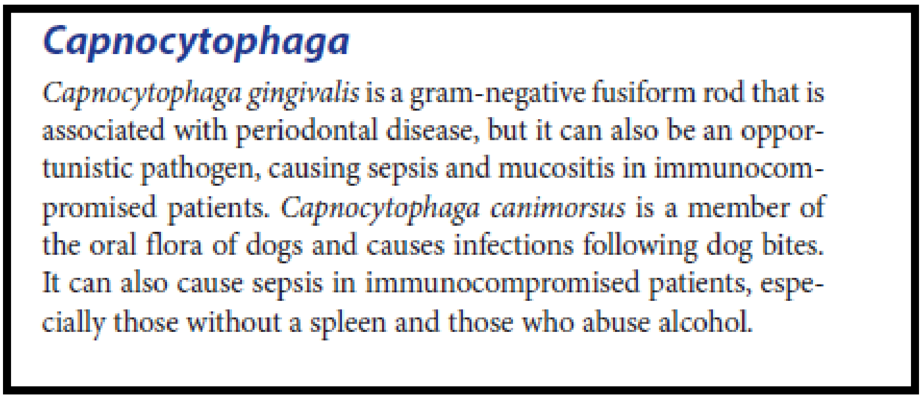
Genus	Gram Stain Morphology	Colony Appearance on Routine Agar	Partially Acid Fast	Nitrate	Urea	Lysozyme Resistance
Actinomadura	Moderate, fine, intertwining, branching with short chains or spores, fragmentation	White-to-pink pigment, mucoid, molar tooth appearance after 2 weeks' incubation; sparse aerial hyphae	–	+	–	–
Gordonia	Short rods	Somewhat pigmented; *G. sputi* smooth, mucoid, and adherent; *G. bronchialis* dry and raised	±	+	+	–
Mycobacterium	Refractile or nonvisible	Dry, buff-colored; some species are pigmented; smooth or rough colonies	Strongly acid fast	±	±	Not performed
Nocardia	Branching, fine, intertwining, delicate filaments with fragmentation	Extremely variable; some isolates are β-hemolytic on SBA; wrinkled; often dry, chalky white appearance to orange-tan pigment; crumbly; may produce spores from aerial hyphae	+	+	+	+
Rhodococcus	Diphtheroid-like with minimal branching or coccobacillary; colony growth appears as coccobacilli in "zigzag" configuration	Nonhemolytic; round; often mucoid with orange-to-red, salmon-pink pigment developing within 4–7 days; pigment may vary widely	±	±	±	±
Streptomyces	Extensive branching with chains and spores; does not fragment easily	Glabrous or waxy heaped colonies; variable morphology; wide range of pigmentation from cream to brown-black; white aerial hyphae	–	±	±	–
Tsukamurella	Mostly long bacilli that fragment; no spores or aerial hyphae	May have rhizoid edges, dry, white-to-creamy-to-orange	±	–	+	+

SBA, Sheep blood agar; +, predominantly positive; –, predominantly negative; ±, predominantly positive with some negative isolates.
Modified from Conville PS, Witebsky FG: *Nocardia, Rhodococcus, Gordonia, Actinomadura, Streptomyces,* and other aerobic actinomycetes. In: Jorgensen JH, et al, editors: *Manual of clinical microbiology,* ed 11, Washington, DC, 2015, ASM Press.

796. A 10-year-old boy with history of dog bite was admitted in intensive care unit. Since admission the child was septic. His father also gave history of splenectomy 3 months back. Blood culture of the patient showed growth of catalase and oxidase positive organisms which form tiny pin point colonies with swarming pattern on SBA & chocolate agar. However, no growth was observed on MacConkey agar. Choose the best treatment option for this patient.

a.wound debridement and supportive care.
b.start amoxicillin clavulanate
c.aztreonam will be the drug of choice in this case
d.start piperacillin tazobactam i/v
e.start treatment with ciprofloxacin.

Key: D



Capnocytophaga

Capnocytophaga gingivalis is a gram-negative fusiform rod that is associated with periodontal disease, but it can also be an opportunistic pathogen, causing sepsis and mucositis in immunocompromised patients. *Capnocytophaga canimorsus* is a member of the oral flora of dogs and causes infections following dog bites. It can also cause sepsis in immunocompromised patients, especially those without a spleen and those who abuse alcohol.

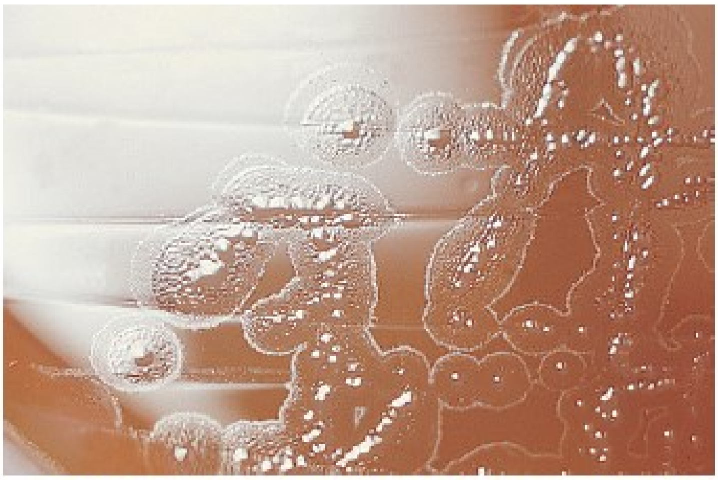
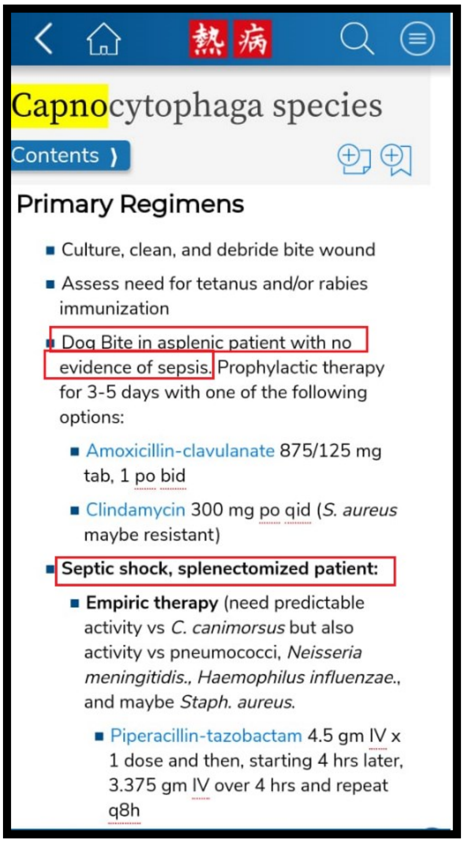


FIG. 18.20 Growth of *Capnocytophaga* organisms on chocolate agar. Note the spreading away from the center of the colony. Compare this growth with *Eikenella* (see Fig. 18.17).



Capnocytophaga species

Primary Regimens

- Culture, clean, and debride bite wound
- Assess need for tetanus and/or rabies immunization
- Dog Bite in asplenic patient with no evidence of sepsis. Prophylactic therapy for 3-5 days with one of the following options:
  - Amoxicillin-clavulanate 875/125 mg tab, 1 po bid
  - Clindamycin 300 mg po qid (*S. aureus* maybe resistant)
- **Septic shock, splenectomized patient:**
  - **Empiric therapy** (need predictable activity vs *C. canimorsus* but also activity vs pneumococci, *Neisseria meningitidis.*, *Haemophilus influenzae.*, and maybe *Staph. aureus.*
    - Piperacillin-tazobactam 4.5 gm IV x 1 dose and then, starting 4 hrs later, 3.375 gm IV over 4 hrs and repeat q8h

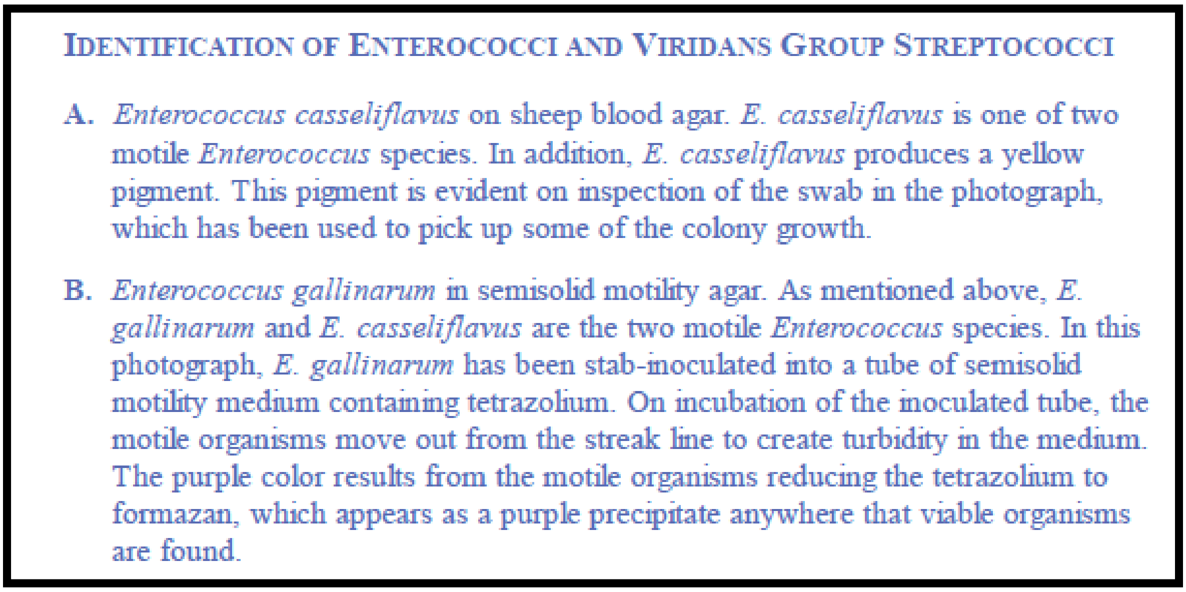
797. A 50-year-old male underwent exploratory laparotomy. Pus collected during the procedure was sent to the lab for culture and sensitivity. After 24 hours of incubation ting smooth yellow colored colonies were seen on SBA which are gram positive on gram staining.Biochemial reactions showed following results

Catalase negative
Oxidase negative
Growth in 6.5 % NaCl

Esculin hydrolysis positive
Motility positive
Fermentation of arabinose positive
The isolate also showed resistance against vancomycin
The most likely organism in this case is

A.enterococcus fecalis.
B.enterococcus gallinarum
C.enterococcus feacium
D.enterococcus casseliflaus
E.enterococcus avium

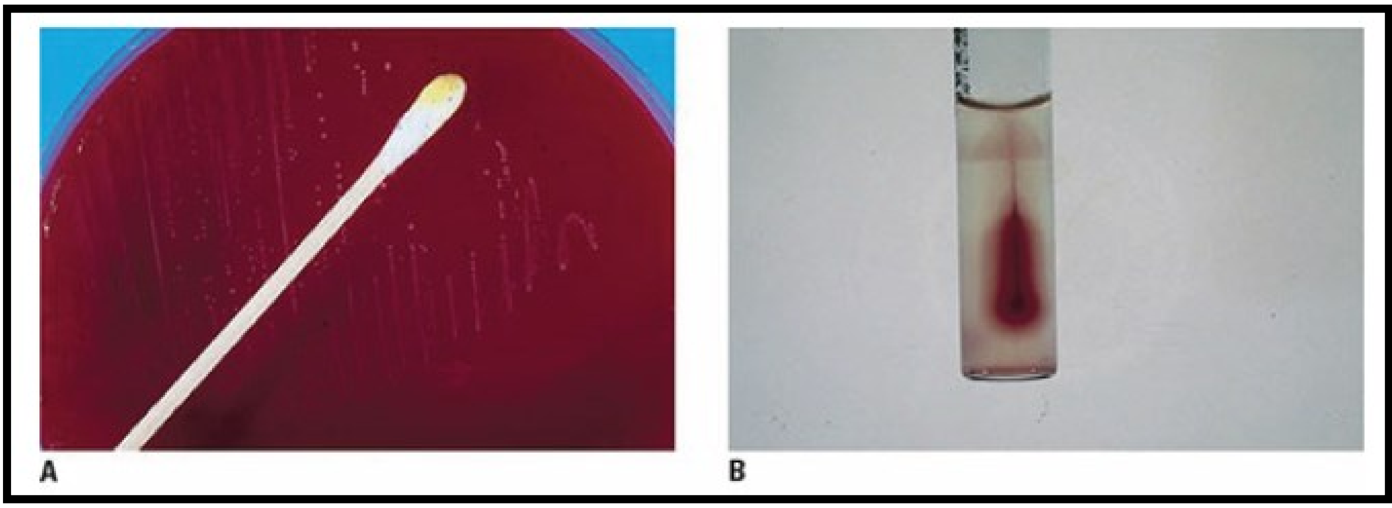
Key: dEnterococcus spp that are intrinsically resistant to vancomycin = Enterococcus gallinarum ,E. casseliflavus



Identification of Enterococci and Viridans Group Streptococci

A. *Enterococcus casseliflavus* on sheep blood agar. *E. casseliflavus* is one of two motile *Enterococcus* species. In addition, *E. casseliflavus* produces a yellow pigment. This pigment is evident on inspection of the swab in the photograph, which has been used to pick up some of the colony growth.

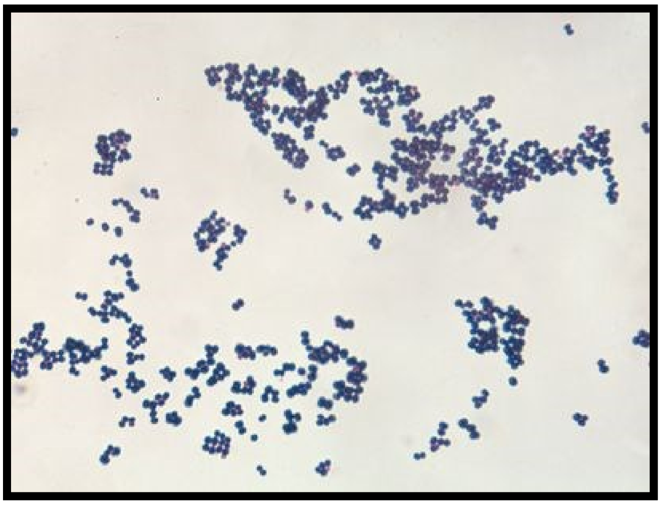
B. *Enterococcus gallinarum* in semisolid motility agar. As mentioned above, *E. gallinarum* and *E. casseliflavus* are the two motile *Enterococcus* species. In this photograph, *E. gallinarum* has been stab-inoculated into a tube of semisolid motility medium containing tetrazolium. On incubation of the inoculated tube, the motile organisms move out from the streak line to create turbidity in the medium. The purple color results from the motile organisms reducing the tetrazolium to formazan, which appears as a purple precipitate anywhere that viable organisms are found.



798. One-year old male was brought to emergency with history of fever and seizures for 3 days. He had history of hydrocephalus for which ventriculoperitoneal shunt was passed.Investigations sent showed normal electrolytes, leukocytosis with raised CRP, CSF examination showed 350 cells (60% mononuclear cells). CSF culture showed growth of yellow colored colonies which are gram positive cocci in tetrads on gram staining. Choose the correct statement regarding this organism.

A. susceptible to bacitracin and resistant to lysostaphin.
B. resistant to bacitracin and susceptible to lysostaphin
C. resistant to bacitracin and lysostaphin
D. susceptible to bacitracin and to lysostaphin
E. NONE OF THE ABOVE

Key: A



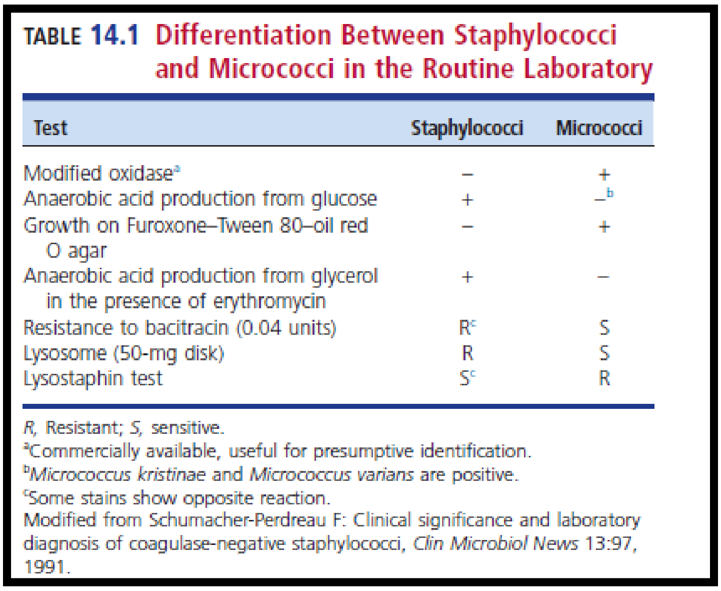


TABLE 14.1 Differentiation Between Staphylococci and Micrococci in the Routine Laboratory

Test	Staphylococci	Micrococci
Modified oxidase[a]	–	+
Anaerobic acid production from glucose	+	–[b]
Growth on Furoxone–Tween 80–oil red O agar	–	+
Anaerobic acid production from glycerol in the presence of erythromycin	+	–
Resistance to bacitracin (0.04 units)	R[c]	S
Lysosome (50-mg disk)	R	S
Lysostaphin test	S[c]	R

R, Resistant; *S*, sensitive.

[a] Commercially available, useful for presumptive identification.

[b] *Micrococcus kristinae* and *Micrococcus varians* are positive.

[c] Some stains show opposite reaction.

Modified from Schumacher-Perdreau F: Clinical significance and laboratory diagnosis of coagulase-negative staphylococci, *Clin Microbiol News* 13:97, 1991.

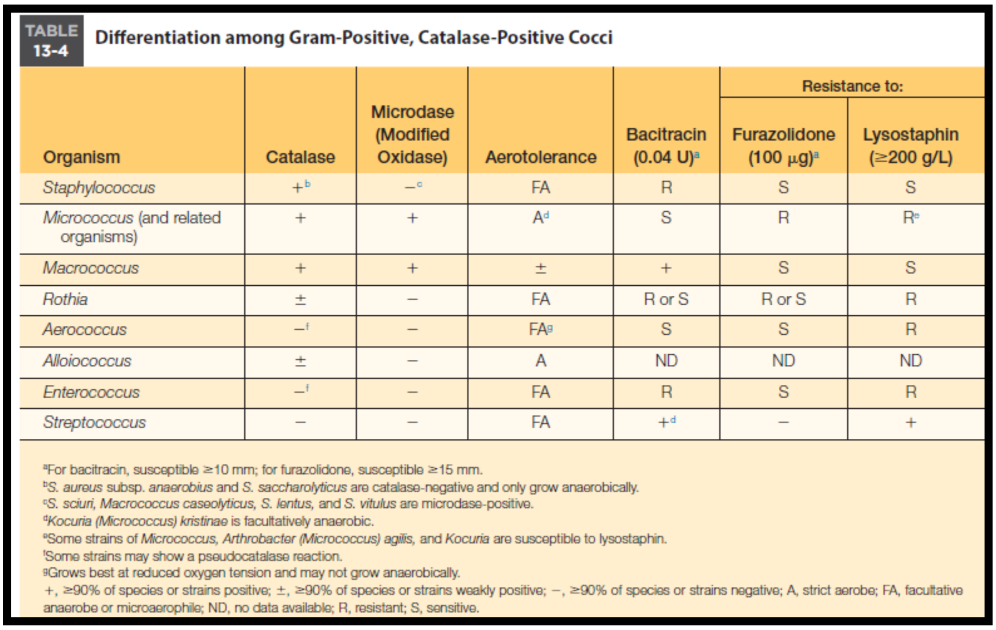


TABLE 13-4 Differentiation among Gram-Positive, Catalase-Positive Cocci

Organism	Catalase	Microdase (Modified Oxidase)	Aerotolerance	Bacitracin (0.04 U)[a]	Resistance to:	
					Furazolidone (100 µg)[a]	Lysostaphin (≥200 g/L)
Staphylococcus	+[b]	–[c]	FA	R	S	S
Micrococcus (and related organisms)	+	+	A[d]	S	R	R[e]
Macrococcus	+	+	±	+	S	S
Rothia	±	–	FA	R or S	R or S	R
Aerococcus	–[f]	–	FA[g]	S	S	R
Alloiococcus	±	–	A	ND	ND	ND
Enterococcus	–[f]	–	FA	R	S	R
Streptococcus	–	–	FA	+[d]	–	+

[a] For bacitracin, susceptible ≥10 mm; for furazolidone, susceptible ≥15 mm.

[b] *S. aureus* subsp. *anaerobius* and *S. saccharolyticus* are catalase-negative and only grow anaerobically.

[c] *S. sciuri, Macrococcus caseolyticus, S. lentus,* and *S. vitulus* are microdase-positive.

[d] *Kocuria (Micrococcus) kristinae* is facultatively anaerobic.

[e] Some strains of *Micrococcus, Arthrobacter (Micrococcus) agilis,* and *Kocuria* are susceptible to lysostaphin.

[f] Some strains may show a pseudocatalase reaction.

[g] Grows best at reduced oxygen tension and may not grow anaerobically.

+, ≥90% of species or strains positive; ±, ≥90% of species or strains weakly positive; –, ≥90% of species or strains negative; A, strict aerobe; FA, facultative anaerobe or microaerophile; ND, no data available; R, resistant; S, sensitive.

799. Blood culture of a 5 year old child with history of high grade fever ,loss of appitite and diarrhea was sent to the lab.growth of nonlactose fermenting colonies were seen on culture media.api 10s showed growth of salmonella typhi.ast was reported according to clsi 2023.keeping in view the above guidelines choose the best definition for tier 3 drugs.

A. Antimicrobial that are appropriate for routine testing., reporting.

B.Antimicrobial that are appropriate for routine testing., reporting.but may be reported following cascade reporting
C. Antimicrobial that are appropriate for routine testing, primary testing for mdros
D. antimicrobial to be reported in urine only.
E. Investigational drugs

Key: C

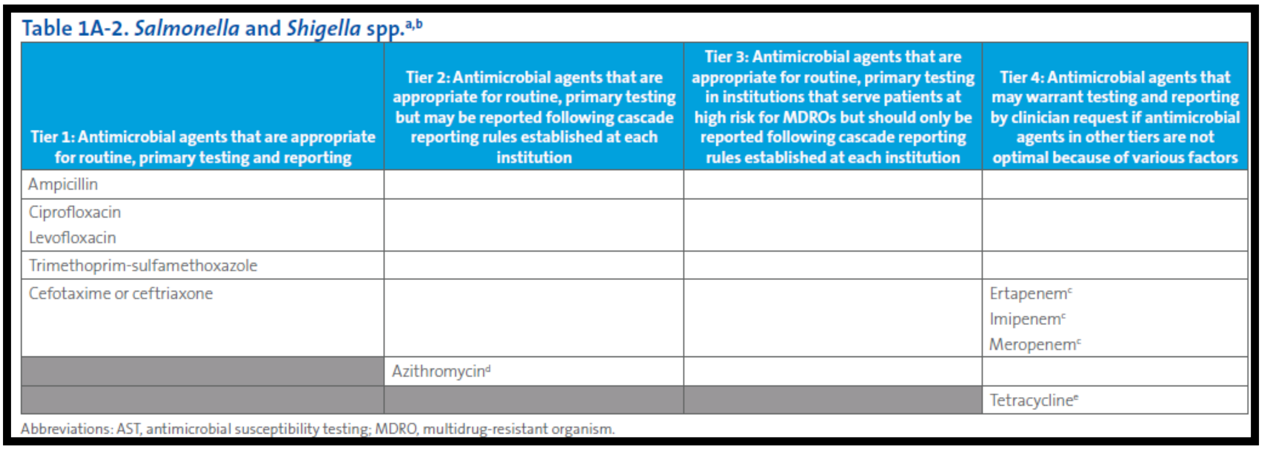


Table 1A-2. *Salmonella* and *Shigella* spp.[a,b]

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Ampicillin			
Ciprofloxacin Levofloxacin			
Trimethoprim-sulfamethoxazole			
Cefotaxime or ceftriaxone			Ertapenem[c] Imipenem[c] Meropenem[c]
	Azithromycin[d]		
			Tetracycline[e]

Abbreviations: AST, antimicrobial susceptibility testing; MDRO, multidrug-resistant organism.

800. Sputum sample of a 35 year old male with history of cystic fibrosis was sent to the lab for culture and sensitivity culture showed growth of medium size nonhemolytic colonies with a greenish hue and ammonia odour.biochemical reaction show
Catalse positve
Dnase positive organisms.
Choose the drug of choice

A. Meropenem
B. Pipracillin Tazobactam
C. Tmp Plus Minocycline
D. Colistin
E. Ceftriaxone

Key: C

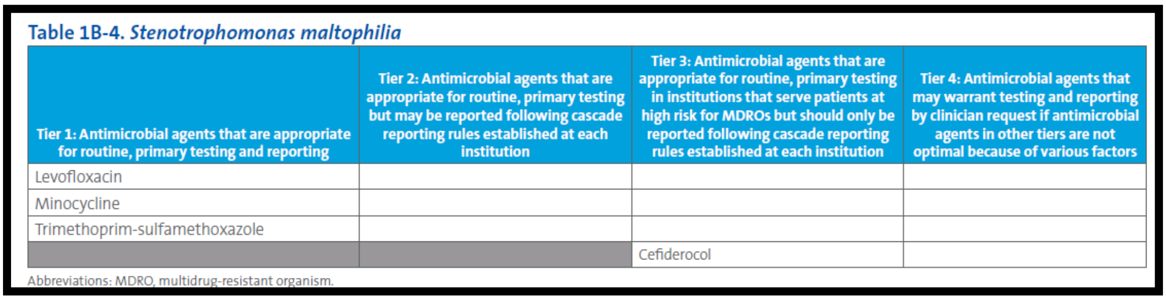
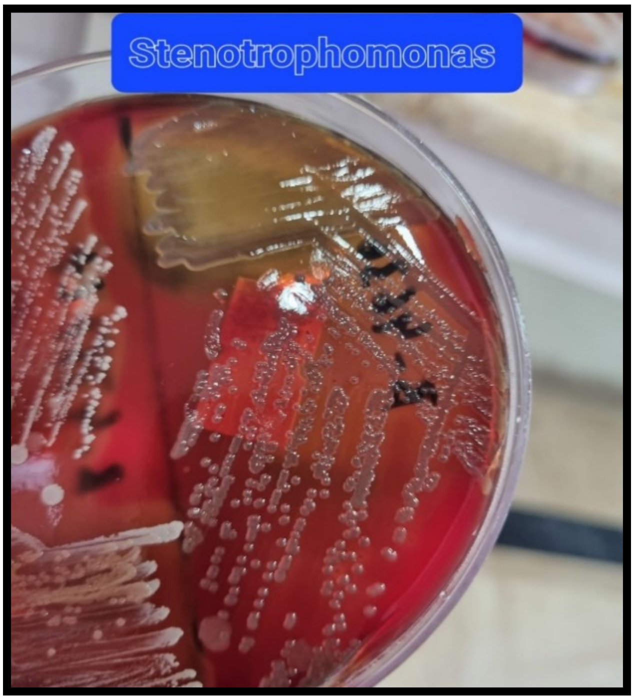
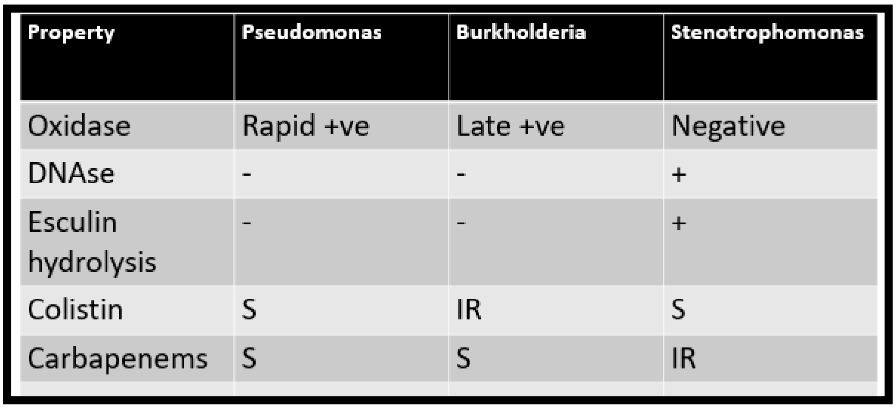


Table 1B-4. *Stenotrophomonas maltophilia*

Tier 1: Antimicrobial agents that are appropriate for routine, primary testing and reporting	Tier 2: Antimicrobial agents that are appropriate for routine, primary testing but may be reported following cascade reporting rules established at each institution	Tier 3: Antimicrobial agents that are appropriate for routine, primary testing in institutions that serve patients at high risk for MDROs but should only be reported following cascade reporting rules established at each institution	Tier 4: Antimicrobial agents that may warrant testing and reporting by clinician request if antimicrobial agents in other tiers are not optimal because of various factors
Levofloxacin			
Minocycline			
Trimethoprim-sulfamethoxazole			
		Cefiderocol	

Abbreviations: MDRO, multidrug-resistant organism.



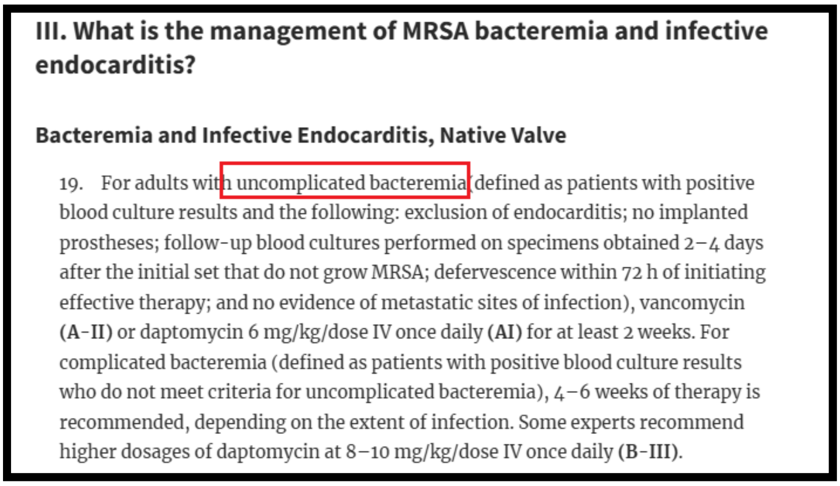


Property	Pseudomonas	Burkholderia	Stenotrophomonas
Oxidase	Rapid +ve	Late +ve	Negative
DNAse	-	-	+
Esculin hydrolysis	-	-	+
Colistin	S	IR	S
Carbapenems	S	S	IR

801. A 30-year-old young football player had a swollen knee joint associated with high grade fever. On examination the joint was red, warm, and swollen and had a joint effusion. The synovial fluid on examination showed cloudy fluid, with neutrophil count >20,000 neutrophils/μL and glucose (fluid/blood ratio <0.25. The physician sent his blood sample for culture and sensitivity, which yield growth of Gram-positive cocci in clusters. The physician made the diagnosis of septic arthritis with bacteremia. Choose the best statement which fulfil criteria of uncomplicated bacteremia.

a) Resolution of fever and systemic infection by the third day of antimicrobial therapy.
b) Presence of hematogenous secondary foci of infection.
c) Presence of echo cardiogenic or clinical signs of endocarditis.
d) Presence of signs and symptoms of osteomyelitis.
e) Recommended treatment will be 4-6 weeks with antibiotic.

Key: A



III. What is the management of MRSA bacteremia and infective endocarditis?

Bacteremia and Infective Endocarditis, Native Valve

19. For adults with uncomplicated bacteremia (defined as patients with positive blood culture results and the following: exclusion of endocarditis; no implanted prostheses; follow-up blood cultures performed on specimens obtained 2–4 days after the initial set that do not grow MRSA; defervescence within 72 h of initiating effective therapy; and no evidence of metastatic sites of infection), vancomycin **(A-II)** or daptomycin 6 mg/kg/dose IV once daily **(AI)** for at least 2 weeks. For complicated bacteremia (defined as patients with positive blood culture results who do not meet criteria for uncomplicated bacteremia), 4–6 weeks of therapy is recommended, depending on the extent of infection. Some experts recommend higher dosages of daptomycin at 8–10 mg/kg/dose IV once daily **(B-III)**.

802. A 25-year-old gravida 2 para 2 having history of burning micturition at 36 weeks of pregnancy. Her gynecologist sent her urine for routine examination and for culture and sensitivity. Her urine complete examination revealed protein ++ and 5-10 pus cell/high power field. The urine culture revealed pure growth of E. coli with >10^5 CFU/ml. Choose the best statement which fulfil the criteria for the treatment of asymptomatic bacteriuria in this patiient

a) 5 days therapy is recommended in pregnancy to treat asymptomatic bacteriuria. (7 days acc to sanford)
b) Use of sulfonamides is the treatment of choice in pregnancy. (no, kernicterus can occur…can be used as alternative therapy but only in the second trimester if no other choice)
c) Avoid nitrofurantoin in last trimester of pregnancy. (as hemolytic anemia can occur)
d) Fosfomycin is not safe in pregnancy.
e) Asymptomatic bacteriuria should not be treated in this case.

Key: C

803. A 4-year-old girl has papular and pustular lesions on her face. The lesions are exuding a honey-colored serous fluid. You make a clinical diagnosis of impetigo. A Gram stain of the exudate reveals gram-positive cocci in chains, and a culture reveals β-hemolytic colonies on blood agar. For which one of the following sequelae is she MOST at risk?

a) Bloody diarrhea
b) Blurred vision
c) Paralysis of the facial nerve (Bell's palsy)
d) Red blood cells and albumin in her urine
e) Rusty-colored sputum

Key: d (After skin manifestations = AGN, after sore throat = RF)

804. The purified genome of certain RNA viruses can enter a cell and elicit the production of progeny viruses (i.e., the genome is infectious). Regarding these viruses, which one of the following statements is MOST accurate?

a. They have a segmented genome.
b. They have a polymerase in the virion.
c. Their genome RNA is double-stranded.
d. They encode a protease that cleaves a precursor polypeptide.
e. Their genome RNA has the same base sequence as mRNA.

Key: CORRECTION B

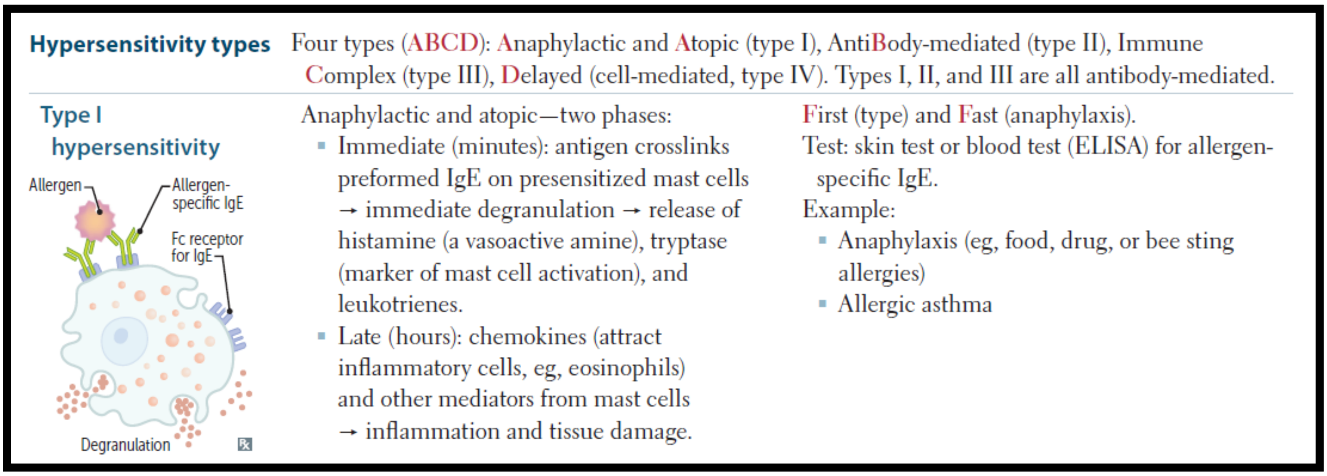
RNA viruses that are infectious when their purified genome is introduced into a cell often have a polymerase within the virion. This polymerase is essential for the virus to replicate its genome and produce progeny viruses, as the host cell's machinery is not capable of replicating viral RNA directly

805. A 77-year-old man with enterococcal endocarditis needed to be treated with penicillin G but had a history of a severe penicillin reaction. He was therefore skin tested using penicilloyl-polylysine as the antigen. Which one of the following is MOST likely to occur in a positive skin test?

a. The antigen forms immune complexes with IgG.

b. The antigen activates CD4-positive T cells and macrophages.
c. The antigen activates the alternative pathway of complement.
d. The antigen activates CD8-positive T cells by binding to class I MHC proteins.
e. The antigen cross-links IgE on the mast cells and causes the release of histamine.

Key: e

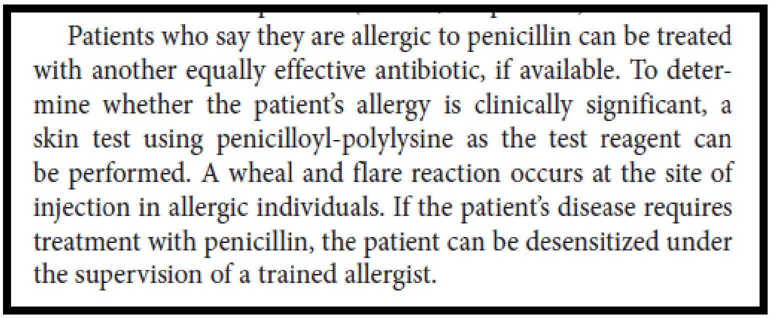

Allergen
Allergen-specific IgE
Fc receptor for IgE
Degranulation

Hypersensitivity types Four types (ABCD): Anaphylactic and Atopic (type I), AntiBody-mediated (type II), Immune Complex (type III), Delayed (cell-mediated, type IV). Types I, II, and III are all antibody-mediated.

Type I hypersensitivity

Anaphylactic and atopic—two phases:
- Immediate (minutes): antigen crosslinks preformed IgE on presensitized mast cells → immediate degranulation → release of histamine (a vasoactive amine), tryptase (marker of mast cell activation), and leukotrienes.
- Late (hours): chemokines (attract inflammatory cells, eg, eosinophils) and other mediators from mast cells → inflammation and tissue damage.

First (type) and Fast (anaphylaxis).
Test: skin test or blood test (ELISA) for allergen-specific IgE.
Example:
- Anaphylaxis (eg, food, drug, or bee sting allergies)
- Allergic asthma



Patients who say they are allergic to penicillin can be treated with another equally effective antibiotic, if available. To determine whether the patient's allergy is clinically significant, a skin test using penicilloyl-polylysine as the test reagent can be performed. A wheal and flare reaction occurs at the site of injection in allergic individuals. If the patient's disease requires treatment with penicillin, the patient can be desensitized under the supervision of a trained allergist.

806. Regarding the Gram stain, which one of the following is the MOST accurate?
a) After adding crystal violet and Gram's iodine, both gram-positive bacteria and gram-negative bacteria will appear blue.
b) If you forget to stain with the red dye (safranin or basic fuchsin), both gram positive bacteria and gram-negative bacteria will appear blue.
c) If you forget to heat-fix, both gram-positive bacteria and gram-negative bacteria will appear blue.
d) One reason why bacteria have a different color in this stain is because the grampositive bacteria have lipid in their membrane, whereas gram-negative bacteria do not.

Key: a

807. A 35-year-old man with a CD4 count of 50 presents with a skin nodule on his chest. The nodule is about 3 cm in diameter and is not red, hot, or tender. He says it has been slowly growing bigger for the past 3 weeks. You biopsy the nodule, and the pathologist calls to say that the patient has disseminated cryptococcosis. Which one of the following is the BEST description of what the pathologist saw in the biopsy specimen?
a. Spherules
b. Non-septate hyphae
c. Germ tubes
d. Budding yeasts with a thick capsule
e. Septate hyphae with low-angle branching

Key: d

808. A 22-year-old woman complains of a persistent nonproductive cough and a fever of 101°F that came on slowly over the last 4 days. Physical examination reveals some rales in the left lung base. A patchy infiltrate is seen on chest X-ray. She works as a secretary in a law office and has not traveled recently. She is not immunocompromised and has not been hospitalized recently. A sample of her serum agglutinates red blood cells at 4°C but not at 37°C. Which one of the following BEST describes the organism that is the MOST likely cause of her disease?

a. A very small bacterium that has no cell wall
b. A gram-negative diplococcus with a large capsule
c. An acid-fast rod that forms colonies within 7 days
d. A filamentous gram-positive rod that is weakly acid-fast
e. A spirochete that has never been grown on blood agar

Key: a

809. The mother of a 4-year-old child notes that her child is sleeping poorly and scratching his anal area. You suspect the child may have pinworms. Which one of the following is the BEST method to make that diagnosis?

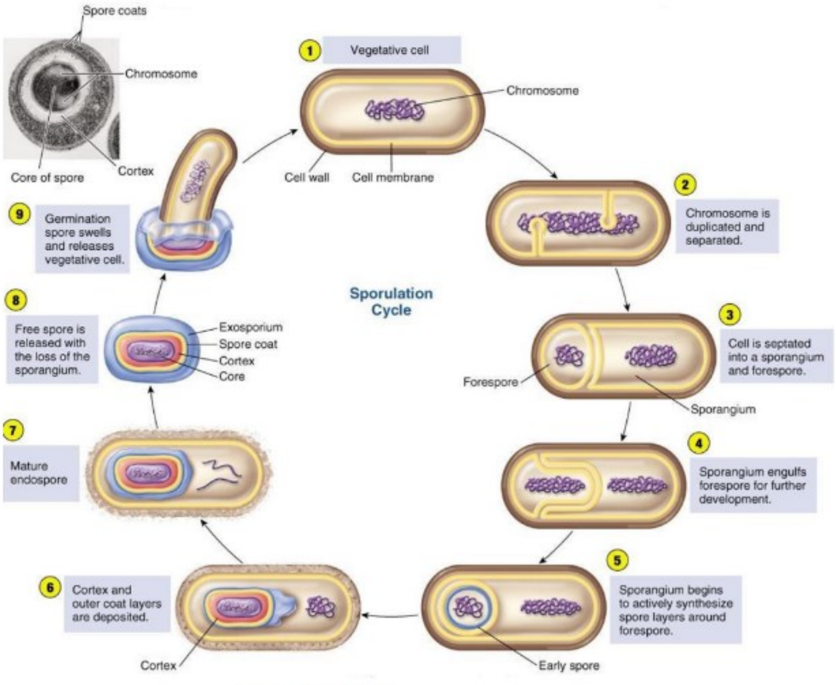
a. Examine the stool for the presence of cysts
b. Examine the stool for the presence of trophozoites
c. Examine a blood smear for the presence of microfilaria
d. Determine the titer of IgE antibody against the organism
e. Examine transparent adhesive tape for the presence of eggs

Key: e

810. Regarding bacterial spores, which one of the following is the MOST accurate?

a. One spore germinates to form one bacterium.
b. They are produced primarily within human red blood cells.
c. They are killed by boiling at sea level but not at high altitude.
d. They are produced by anaerobes only in the presence of oxygen.
e. They contain endotoxin, which accounts for their ability to cause disease.

Key: a


Spore coats
Chromosome
Core of spore
Cortex
1 Vegetative cell
Chromosome
Cell wall
Cell membrane
2 Chromosome is duplicated and separated.
3 Cell is septated into a sporangium and forespore.
Forespore
Sporangium
4 Sporangium engulfs forespore for further development.
5 Sporangium begins to actively synthesize spore layers around forespore.
Early spore
6 Cortex and outer coat layers are deposited.
Cortex
7 Mature endospore
8 Free spore is released with the loss of the sporangium.
Exosporium
Spore coat
Cortex
Core
9 Germination spore swells and releases vegetative cell.
Sporulation Cycle

Stages of Sporulation

Image Credit:

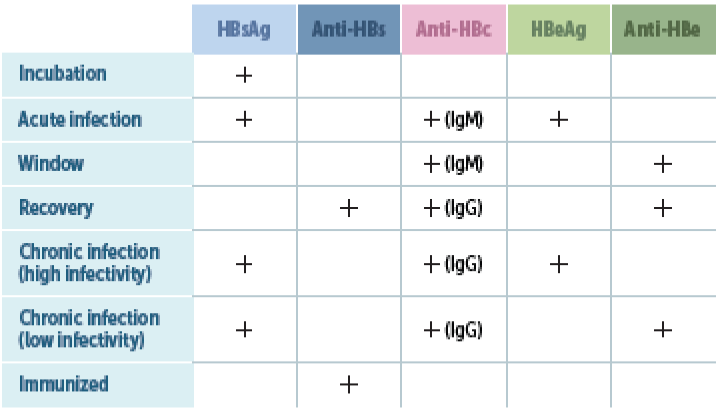
811. A 22-year-old woman had fever to 100°F and anorexia for the past 2 days, and this morning she appears jaundiced. On examination, her liver is enlarged and tender. She has a total bilirubin of 5 mg/dL (normal, <1) and elevated transaminases. She received the complete course of the hepatitis B vaccine 2 years ago but has not had the hepatitis A vaccine. The results of her hepatitis serologies are as follows: HAVIgM negative, HAVIgG positive, HBsAg negative, HBsAb positive, HBcAb negative, HCV-Ab positive. Of the following, which one is the MOST accurate?

a. She probably has hepatitis A now, probably has not been infected with hepatitis B virus (HBV), and probably had hepatitis C in the past.
b. She probably has hepatitis A now, probably has been infected with HBV in the past, and probably had hepatitis C in the past.
c. She has been infected with hepatitis A virus (HAV) in the past, probably has not been infected with

HBV, and probably has hepatitis C now.

d. She has been infected with HAV in the past, probably has hepatitis B now, and probably had hepatitis C in the past.

Key: c

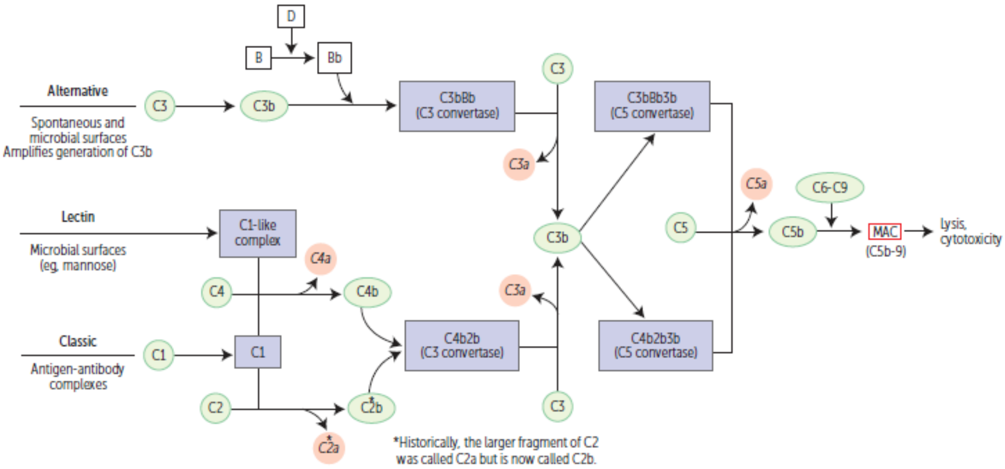


	HBsAg	Anti-HBs	Anti-HBc	HBeAg	Anti-HBe
Incubation	+				
Acute infection	+		+ (IgM)	+	
Window			+ (IgM)		+
Recovery		+	+ (IgG)		+
Chronic infection (high infectivity)	+		+ (IgG)	+	
Chronic infection (low infectivity)	+		+ (IgG)		+
Immunized		+			

812. Regarding the function of the different classes of antibodies, which one of the following statements is the MOST accurate?

a. IgA acts as an antigen receptor on the surface of B cells.
b. IgG activates the alternative pathway of complement, resulting in the production of C3a that degrades the bacterial cell wall.
c. IgG binds to the bacterial surface and makes the bacteria more easily ingested by phagocytes.
d. IgM defends against worm parasites, such as hookworms.
e. IgE blocks the binding of viruses to the gut mucosa.

Key: c


D
B
Bb
Alternative
Spontaneous and microbial surfaces
Amplifies generation of C3b
C3
C3b
C3bBb
(C3 convertase)
C3
C3bBb3b
(C5 convertase)
C3a
C5a
C6-C9
Lectin
Microbial surfaces
(eg, mannose)
C1-like complex
C3b
C5
C5b
MAC
(C5b-9)
lysis, cytotoxicity
C4a
C4
C4b
C3a
Classic
Antigen-antibody complexes
C1
C1
C4b2b
(C3 convertase)
C4b2b3b
(C5 convertase)
C2
C2b*
C3
C2a*

*Historically, the larger fragment of C2 was called C2a but is now called C2b.

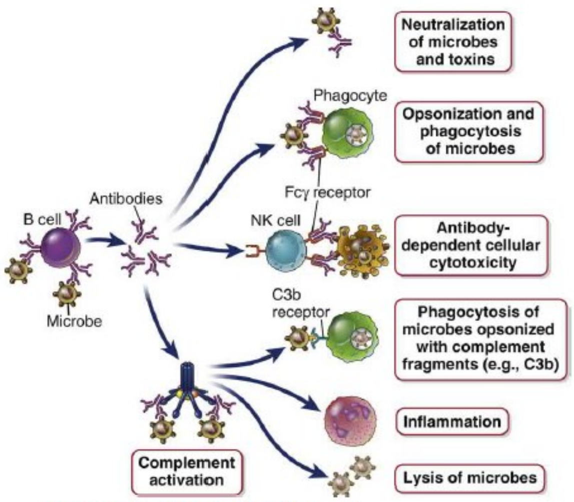

Neutralization of microbes and toxins
Phagocyte
Opsonization and phagocytosis of microbes
Antibodies
B cell
Fcγ receptor
NK cell
Antibody-dependent cellular cytotoxicity
Microbe
C3b receptor
Phagocytosis of microbes opsonized with complement fragments (e.g., C3b)
Inflammation
Complement activation
Lysis of microbes

FIGURE 13.1 Effector functions of antibodies. Antibodies against microbes (and their toxins, not shown) neutralize these agents, opsonize them for phagocytosis, sensitize them for antibody-dependent cellular cytotoxicity, and activate the complement system. These various effector functions may be mediated by different antibody isotypes. *NK,* Natural killer.

813. The two most common types of viral vaccines are killed vaccines and live, attenuated vaccines. Regarding these vaccines, which one of the following statements is the MOST accurate?

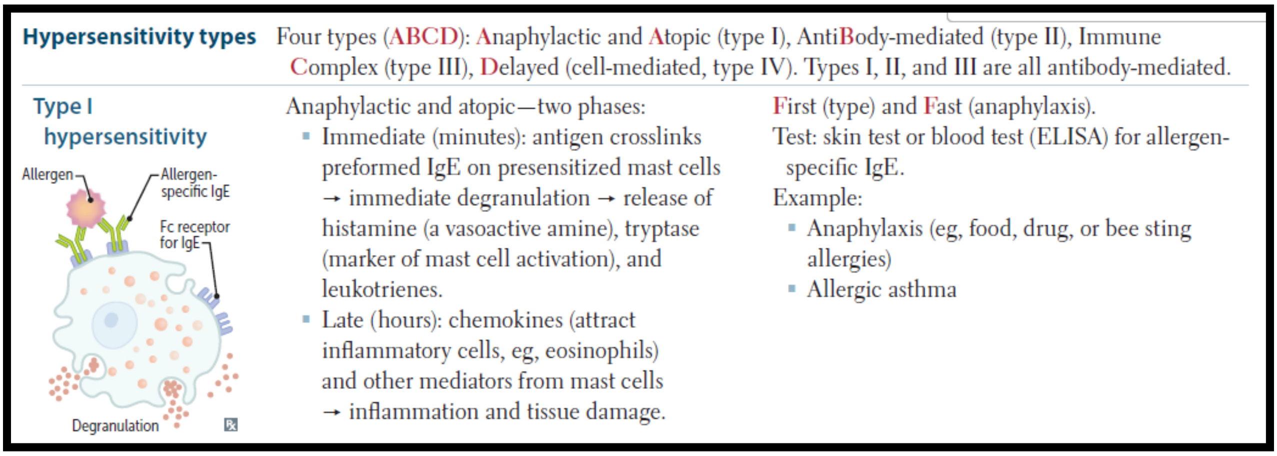
a. Killed vaccines induce a longer-lasting response than do live, attenuated vaccines.
b. Killed vaccines are no longer used in this country because they do not induce secretory IgA.
c. Killed vaccines induce a broader range of immune responses than do live, attenuated vaccines.
d. Killed vaccines are safer to give to immunocompromised patients than are live, attenuated vaccines.

Key: d

814. Regarding immediate (type I) and immune complex (type III) hypersensitivities, which one of the following is the MOST accurate?

a. IgE is involved in both immediate and immune complex hypersensitivities.
b. Complement is involved in both immediate and immune complex hypersensitivities.
c. Less antigen is typically needed to trigger an immediate reaction than an immune complex reaction.
d. Neutrophils play a more important role in immediate reactions than in immune complex reactions.

Key: c



Hypersensitivity types	Four types (ABCD): Anaphylactic and Atopic (type I), AntiBody-mediated (type II), Immune Complex (type III), Delayed (cell-mediated, type IV). Types I, II, and III are all antibody-mediated.	
Type I hypersensitivity	Anaphylactic and atopic—two phases: ▪ Immediate (minutes): antigen crosslinks preformed IgE on presensitized mast cells → immediate degranulation → release of histamine (a vasoactive amine), tryptase (marker of mast cell activation), and leukotrienes. ▪ Late (hours): chemokines (attract inflammatory cells, eg, eosinophils) and other mediators from mast cells → inflammation and tissue damage.	First (type) and Fast (anaphylaxis). Test: skin test or blood test (ELISA) for allergen-specific IgE. Example: ▪ Anaphylaxis (eg, food, drug, or bee sting allergies) ▪ Allergic asthma

Allergen
Allergen-specific IgE
Fc receptor for IgE
Degranulation

Type I hypersensitivity requires less antigen to trigger a reaction because IgE is pre-bound to mast cells and basophils, making it highly sensitive to even minimal allergen exposure.

815. Disease caused by which one of the following bacteria can be prevented by a toxoid vaccine?

a. Actinomyces israelii
b. Bacteroides fragilis
c. Borrelia burgdorferi
d. Corynebacterium diphtheriae
e. Haemophilus influenzae

Key: d

816. A 50-year-old woman has had a gradual onset of headaches that have become increasingly more severe during the past 3 weeks. On examination, she is confused regarding time, place, and person, and she is febrile to 39°C. Her spinal fluid reveals a normal glucose, normal protein, and 17 cells, all of which were lymphocytes. Gram stain of the spinal fluid shows no organism. An MRI reveals a 2-cm radiolucent lesion in the temporal lobe. A biopsy of the brain lesion was performed. A Giemsa stain of the tissue shows multinucleated giant cells with intranuclear inclusion bodies. Which one of the following is the MOST likely causative organism?

a. Adenovirus
b. Coxsackie virus
c. Cytomegalovirus
d. Herpes simplex virus type 1

Key: d

REMEMBERRRR!

- **Intranuclear inclusions = CMV and HSV**
- **Intracytoplasmic inclusions = Molluscum contagiosum and Rabies**

817. An 80-year-old man had a carcinoma of the colon removed 3 days ago. He was doing well until this morning, when he spiked a fever to 39°C and complained of severe abdominal pain. Examination revealed a “board-like” abdomen indicative of peritonitis. He was taken to the operating room, where it was discovered that his anastomosis had broken down and bowel contents had spilled into the peritoneal cavity. A foulsmelling exudate was observed. A Gram stain of the peritoneal exudate revealed many gram-negative rods. Which one of the following sets of bacteria is the MOST likely cause of this infection?

a. Escherichia coli and Brucella melitensis
b. Enterobacter cloacae and Salmonella enteritidis
c. Fusobacterium nucleatum and Bacteroides fragilis
d. Haemophilus influenzae and Actinomyces israelii
e. Shigella dysenteriae and Serratia marcescens

Key: c

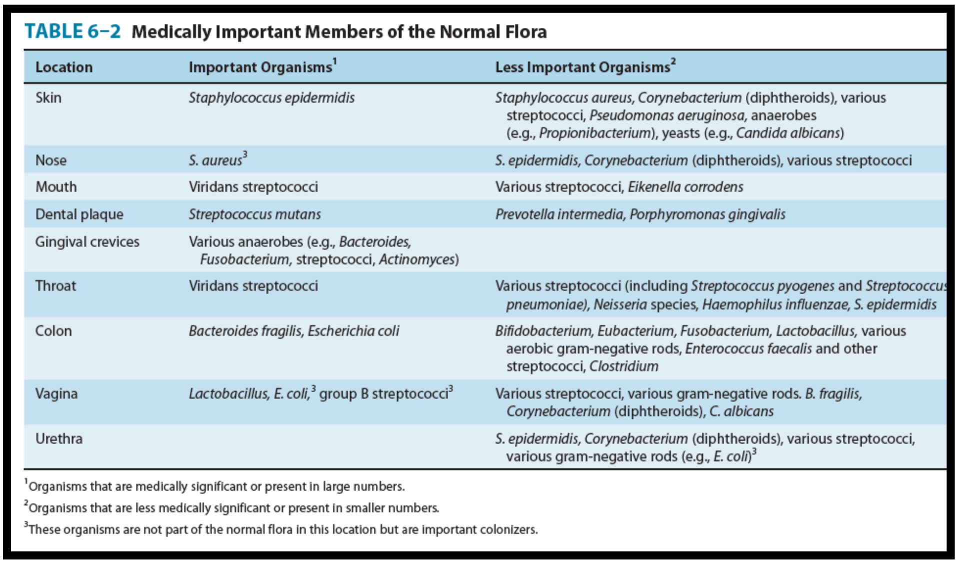


TABLE 6–2 Medically Important Members of the Normal Flora

Location	Important Organisms[1]	Less Important Organisms[2]
Skin	*Staphylococcus epidermidis*	*Staphylococcus aureus, Corynebacterium* (diphtheroids), various streptococci, *Pseudomonas aeruginosa*, anaerobes (e.g., *Propionibacterium*), yeasts (e.g., *Candida albicans*)
Nose	*S. aureus*[3]	*S. epidermidis, Corynebacterium* (diphtheroids), various streptococci
Mouth	Viridans streptococci	Various streptococci, *Eikenella corrodens*
Dental plaque	*Streptococcus mutans*	*Prevotella intermedia, Porphyromonas gingivalis*
Gingival crevices	Various anaerobes (e.g., *Bacteroides, Fusobacterium*, streptococci, *Actinomyces*)	
Throat	Viridans streptococci	Various streptococci (including *Streptococcus pyogenes* and *Streptococcus pneumoniae*), *Neisseria* species, *Haemophilus influenzae, S. epidermidis*
Colon	*Bacteroides fragilis, Escherichia coli*	*Bifidobacterium, Eubacterium, Fusobacterium, Lactobacillus*, various aerobic gram-negative rods, *Enterococcus faecalis* and other streptococci, *Clostridium*
Vagina	*Lactobacillus, E. coli,*[3] group B streptococci[3]	Various streptococci, various gram-negative rods. *B. fragilis, Corynebacterium* (diphtheroids), *C. albicans*
Urethra		*S. epidermidis, Corynebacterium* (diphtheroids), various streptococci, various gram-negative rods (e.g., *E. coli*)[3]

[1] Organisms that are medically significant or present in large numbers.

[2] Organisms that are less medically significant or present in smaller numbers.

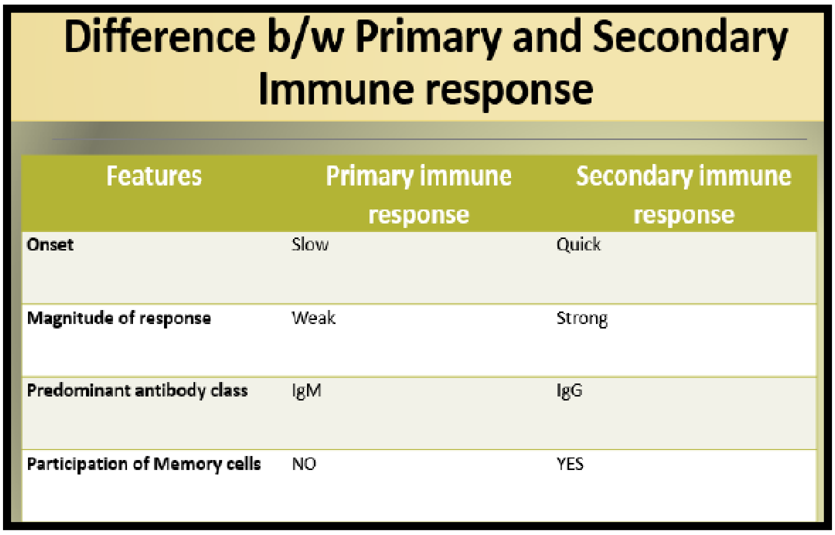
[3] These organisms are not part of the normal flora in this location but are important colonizers.

818. Regarding the primary and secondary antibody responses, which one of the following statements is MOST accurate?

a. The IgM made in the primary response is made primarily by memory B cells.
b. The lag phase is shorter in the primary response than in the secondary response.

c. In the primary response, memory B cells are produced, but memory T cells are not. (D) Antigen must be processed and presented in the primary response but not in the secondary response.
d. The amount of IgG made in the secondary response is greater than the amount made in the primary response.

Key: d



Difference b/w Primary and Secondary Immune response

Features	Primary immune response	Secondary immune response
Onset	Slow	Quick
Magnitude of response	Weak	Strong
Predominant antibody class	IgM	IgG
Participation of Memory cells	NO	YES

Primary Immune Response = The immune response upon first exposure to an antigen.

Secondary Immune Response = The immune response upon subsequent exposure to the same antigen.

819. A 70-year-old man who is receiving chemotherapy for leukemia develops a fever to 40°C and has two episodes of teeth-chattering chills, and his blood pressure drops to 80/20 mmHg. Of the following factors, which one is MOST likely to be the cause of his fever, chills, and hypotension?

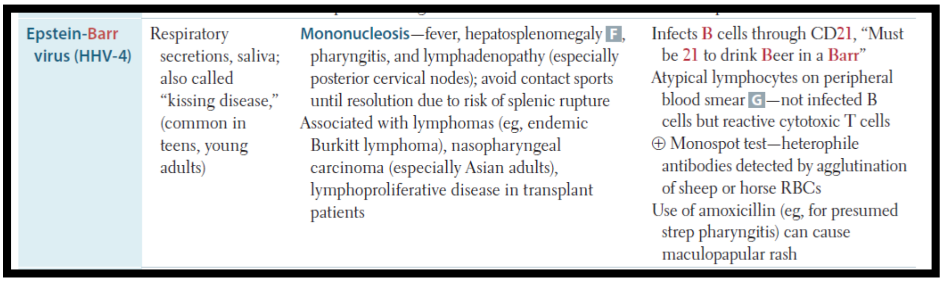
a. Coagulase
b. Dipicolinic acid
c. Glycocalyx
d. Lipid A
e. Mycolic acid

Key: d

820. A 22-year-old woman presents with “the worst sore throat I’ve ever had.” She also complains of fatigue and anorexia. She is not immunocompromised and has not been hospitalized recently. On examination, she is febrile to 38°C, the pharynx is inflamed, and there are a few tender cervical nodes bilaterally. There are no white lesions on the tongue or pharynx. A throat culture grows alpha-hemolytic colonies on blood agar that are optochin-resistant. Of the following, which one is the MOST likely cause?

a. Candida albicans
b. Epstein–Barr virus
c. Parvovirus B19
d. Pneumocystis carinii
e. Poliovirus

Key: b



Epstein-Barr virus (HHV-4)	Respiratory secretions, saliva; also called "kissing disease," (common in teens, young adults)	Mononucleosis—fever, hepatosplenomegaly F, pharyngitis, and lymphadenopathy (especially posterior cervical nodes); avoid contact sports until resolution due to risk of splenic rupture Associated with lymphomas (eg, endemic Burkitt lymphoma), nasopharyngeal carcinoma (especially Asian adults), lymphoproliferative disease in transplant patients	Infects B cells through CD21, "Must be 21 to drink Beer in a Barr" Atypical lymphocytes on peripheral blood smear G—not infected B cells but reactive cytotoxic T cells ⊕ Monospot test—heterophile antibodies detected by agglutination of sheep or horse RBCs Use of amoxicillin (eg, for presumed strep pharyngitis) can cause maculopapular rash

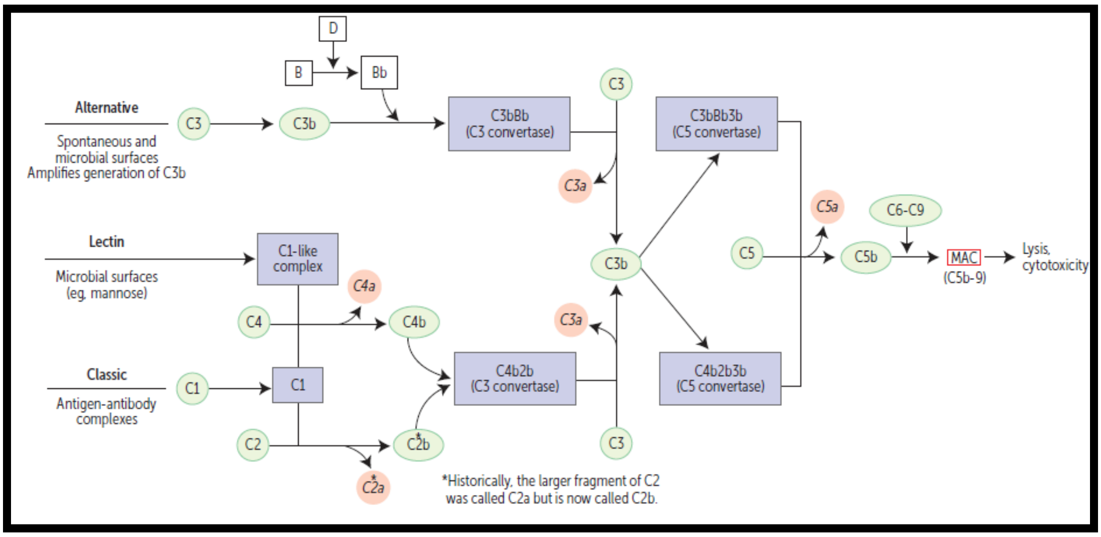
821. Regarding the complement pathway, which one of the following is MOST accurate?

a. C5a mediates chemotaxis and attracts neutrophils to the site of infection.
b. C5b plays an important role in the opsonization of gram-negative bacteria.
c. C3a is a decay-accelerating factor that causes the rapid decay and death of bacteria.
d. C1 binds to the surface of gram-positive bacteria, which initiates the classic pathway.
e. The membrane attack complex is produced in the classic pathway but not in the alternative pathway.

Key: a

Key Roles of Complement Components:

1. **C5a:**
   - ○ **A powerful chemoattractant that attracts neutrophils and other immune cells to the site of infection.**
   - ○ **Also increases vascular permeability and inflammation.**
2. **C5b:**
   - ○ **Initiates the formation of the membrane attack complex (MAC), but does not play a role in opsonization.**
3. **C3a:**
   - ○ **An anaphylatoxin, it promotes inflammation by inducing mast cell degranulation and increasing vascular permeability, but it is not a decay-accelerating factor. IT IS NOT DAF. Decay-accelerating factor (DAF), also known as CD55, is a regulatory protein that plays an important role in protecting host cells from the complement system's attack.**
4. **C1:**
   - ○ **Part of the classical pathway, but it binds to antibody-antigen complexes, not directly to the surface of bacteria.**
5. **Membrane Attack Complex (MAC):**
   - ○ **Formed by components C5b–C9, it creates pores in the cell membrane of gram-negative bacteria to induce lysis.**
   - ○ **The MAC is produced in both the classical and alternative pathways, making e incorrect.**


D
B
Bb
Alternative
Spontaneous and microbial surfaces
Amplifies generation of C3b
C3
C3b
C3bBb (C3 convertase)
C3
C3a
C3bBb3b (C5 convertase)
Lectin
Microbial surfaces (eg, mannose)
C1-like complex
C4a
C4
C4b
C3b
C5a
C6-C9
C5
C5b
MAC (C5b-9)
Lysis, cytotoxicity
C3a
Classic
Antigen-antibody complexes
C1
C1
C4b2b (C3 convertase)
C4b2b3b (C5 convertase)
C2
C2b
C3
C2a
*Historically, the larger fragment of C2 was called C2a but is now called C2b.

822. A 9-year-old girl was playing soccer when she began to limp. She has a pain in her leg and points to her upper thigh when asked where it hurts. Her temperature is 101°F. X-ray of the femur reveals that the periosteum is eroded. You order a blood culture. Which one of the following would be the MOST likely blood culture findings?

a) Gram-negative rods that grow on EMB agar, forming purple colonies and a green sheen
b) Gram-positive cocci that grow on blood agar, causing a clear zone of hemolysis, and are coagulase-positive
c) Gram-positive rods that grow only anaerobically and form a double zone of hemolysis on blood agar
d) Gram-negative diplococci that grow on chocolate agar, are oxidase-positive, and ferment maltose
e) Gram-positive cocci that grow on blood agar, causing a green zone of hemolysis, and are not inhibited by optochin and bile

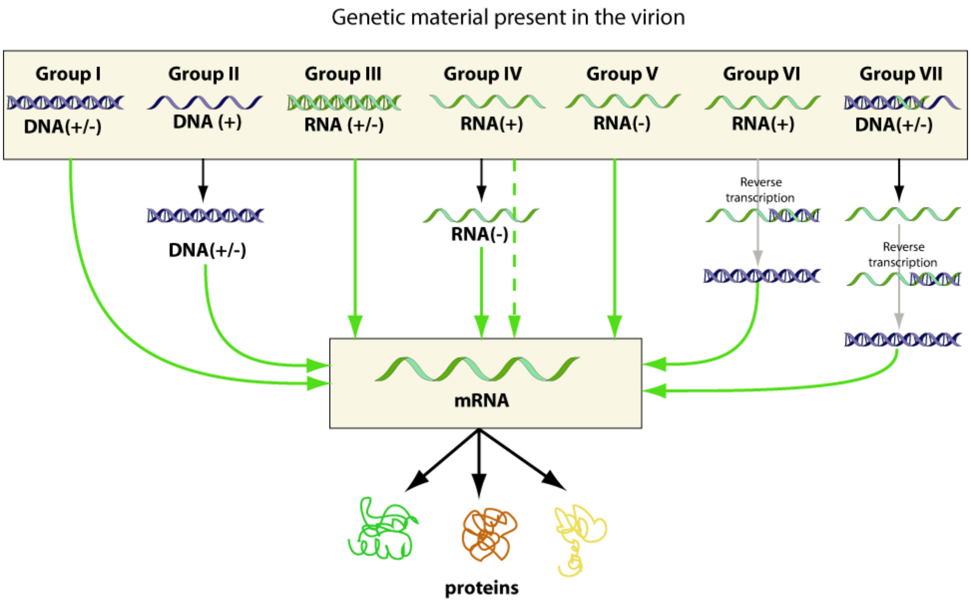
Key: b

823. Your summer research project is to study the viruses that cause upper respiratory tract infections. You have isolated a virus from a patient's throat and find that its genome is RNA. Furthermore, you find that the genome is the complement of viral mRNA within the infected cell. Of the following, which one is the MOST appropriate conclusion you could draw?

a) The virion contains a polymerase.
b) The purified genome RNA is infectious.
c) The genome RNA is segmented.
d) A single-stranded DNA is synthesized during replication.
e) The genome RNA encodes a precursor polypeptide that must be cleaved by a protease.

When you say the genome is **the complement of viral mRNA**, it means the RNA is **negative-sense**, as it is the opposite (complementary) to the mRNA that would be used for protein synthesis. Therefore, they must carry their own **RNA-dependent RNA polymerase** in the virion to transcribe the negative-sense RNA into positive-sense mRNA, which can then be translated into proteins.

Key: a



824. A 25-year-old man has a history of four episodes of boils in the last year. Boils are abscesses caused by Staphylococcus aureus. Which one of the following is MOST likely to be the underlying immunologic factor that predisposes him to multiple episodes of boils?

a) A deficient amount of the C8 component of complement in his plasma
b) An inability of his macrophages to present antigen in association with class I MHC proteins
c) A failure to release granzymes from his cytotoxic T cells
d) An insufficient amount of IgG in his plasma

Key: d

IgG antibodies are essential for opsonization (marking bacteria for destruction) and enhancing phagocytosis by immune cells like neutrophils and macrophages.

If there is an insufficient amount of IgG in the plasma, the immune system will have difficulty mounting a strong defense against infections, including *S. aureus*, leading to repeated infections like boils.

WHY NOT OTHER OPTIONS?

a) **A deficient amount of the C8 component of complement in his plasma:**
The complement system is important for immune defense, especially in fighting bacterial infections. C8 is part of the membrane attack complex (MAC), which helps to kill certain bacteria. However, the inability to form the MAC typically results in more susceptibility to Neisseria infections (e.g., *Neisseria meningitidis*, *Neisseria gonorrhoeae*) rather than *S. aureus*. Therefore, this is less likely to cause recurrent boils.

b) **An inability of his macrophages to present antigen in association with class I MHC proteins:**
Class I MHC molecules present antigens to cytotoxic T cells (CD8+ T cells), but this would primarily affect responses to viruses or intracellular pathogens. *S. aureus* is an extracellular bacterium, and the problem described here wouldn't specifically predispose the person to boils. For **extracellular pathogens**, the immune response is primarily mediated by **CD4+ T cells** and **antibodies (especially IgG)**

c) **A failure to release granzymes from his cytotoxic T cells:**
Granzymes are enzymes released by cytotoxic T cells to induce apoptosis in infected cells. This plays a role in defending against viruses or tumors but is not critical for fighting extracellular bacteria like *S. aureus*. Therefore, a failure in granzymes release wouldn't directly explain recurrent boils.

825. You are reading an article that says that otitis media is commonly caused by nonencapsulated strains of

Haemophilus influenzae. You are surprised that nonencapsulated strains can cause this disease. Which one of the following BEST explains why your surprise is justified?

a) Nonencapsulated strains would not have endotoxin.
b) Nonencapsulated strains cannot secrete exotoxin A.
c) Nonencapsulated strains should be easily phagocytized.
d) Nonencapsulated strains should be rapidly killed by ultraviolet light.
e) Nonencapsulated strains should be susceptible to killing by cytotoxic T cells.

Key: c

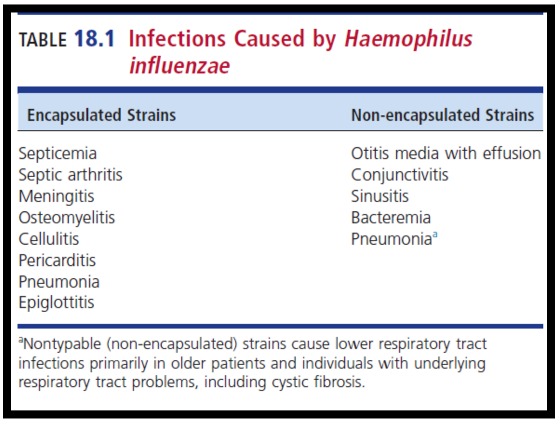


TABLE 18.1 Infections Caused by *Haemophilus influenzae*

Encapsulated Strains	Non-encapsulated Strains
Septicemia	Otitis media with effusion
Septic arthritis	Conjunctivitis
Meningitis	Sinusitis
Osteomyelitis	Bacteremia
Cellulitis	Pneumonia[a]
Pericarditis	
Pneumonia	
Epiglottitis	

[a] Nontypable (non-encapsulated) strains cause lower respiratory tract infections primarily in older patients and individuals with underlying respiratory tract problems, including cystic fibrosis.

Despite being less virulent than encapsulated strains, nonencapsulated strains of *Haemophilus influenzae* can still cause disease through their ability to colonize the mucosa, evade immune responses through mechanisms like IgA proteases and biofilm formation, and exploit host factors such as compromised immunity or concurrent infections.

826. A 35-year-old man is HIV antibody positive and has a CD4 count of 50/mL (normal, 1000–1500). He has had a fever of 101°F for a few weeks and “feels tired all the time.” He has no other symptoms, and findings on physical examination are normal. Complete blood cell count, urinalysis, and chest X-ray are normal. Blood, stool, and urine cultures show no growth. A bone marrow biopsy reveals granulomas, and a culture grows an organism that is a budding yeast at 37°C but produces hyphae at 25°C. Of the following, which one is the MOST likely cause?

a) Aspergillus fumigatus
b) Cryptococcus neoformans
c) Mucor species
d) Histoplasma capsulatum
e) Coccidioides immitis

Key: d

827. A 70-year-old woman has sustained third-degree burns over a significant area of her body. Despite appropriate burn care in the hospital, she spiked a fever to 39°C, and the nurse reports blue-green pus on the dressing covering the burned area. Gram stain of the pus reveals gram negative rods, and antibiotic sensitivity tests show resistance to most antibiotics. Which one of the following organisms is MOST likely to cause this disease?

a) Nocardia asteroides
b) Vibrio vulnificus
c) Bacteroides fragilis
d) Haemophilus influenzae
e) Pseudomonas aeruginosa

Key: e

828. A 20-year-old woman has had several episodes of high fever, shaking chills, and a severe headache. She has a hematocrit of 30%. She has recently returned from Africa, where she was a Peace Corps volunteer. Which one of the following is MOST likely to be seen in the blood smear sample from this patient?

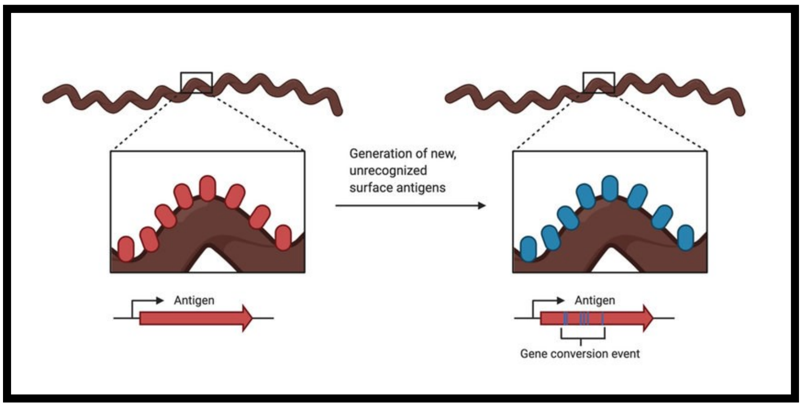
a) Acid-fast rods
b) Banana-shaped gametocytes
c) Nonseptate hyphae
d) Spherules
e) Tachyzoites

Key: b

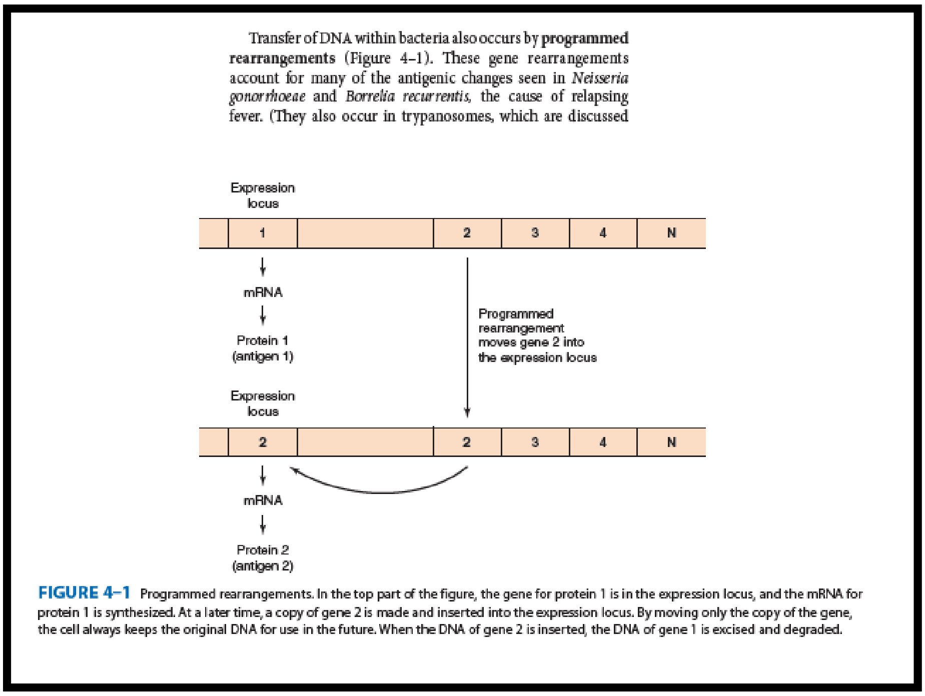
829. Certain microorganisms, such as the protozoan Trypanosoma and the bacterium Neisseria gonorrhoeae, can change their surface antigens quite frequently. This allows the organisms to evade our host defenses. Which one of the following BEST explains how this frequent change in antigenicity occurs?

a) It is due to the transposition of existing genes into an active expression site.
b) It is due to the acquisition of new fertility plasmids by transduction.
c) It is due to conjugation, during which the recipient obtains new chromosomal genes.
d) It is due to new mutations that occur at “hot spots” in the genome.

Key: a


Generation of new, unrecognized surface antigens
Antigen
Antigen
Gene conversion event

Antigenic variation refers to the process by which certain microorganisms, like *Trypanosoma* and *Neisseria gonorrhoeae*, change their surface antigens to avoid immune detection.



Transfer of DNA within bacteria also occurs by **programmed rearrangements** (Figure 4–1). These gene rearrangements account for many of the antigenic changes seen in *Neisseria gonorrhoeae* and *Borrelia recurrentis*, the cause of relapsing fever. (They also occur in trypanosomes, which are discussed

Expression locus
1
2
3
4
N
mRNA
Protein 1 (antigen 1)
Programmed rearrangement moves gene 2 into the expression locus
Expression locus
2
2
3
4
N
mRNA
Protein 2 (antigen 2)

FIGURE 4–1 Programmed rearrangements. In the top part of the figure, the gene for protein 1 is in the expression locus, and the mRNA for protein 1 is synthesized. At a later time, a copy of gene 2 is made and inserted into the expression locus. By moving only the copy of the gene, the cell always keeps the original DNA for use in the future. When the DNA of gene 2 is inserted, the DNA of gene 1 is excised and degraded.

830. A 60-year-old woman had an adenocarcinoma of the colon that was surgically removed. Several blood transfusions were given, and she did well until 3 weeks after surgery, when fever, vomiting, and diarrhea began. Blood and stool cultures were negative for bacteria, and the tests for Clostridium difficile and hepatitis B surface antigen were negative. A liver biopsy revealed intranuclear inclusion bodies. Which one of the following is the MOST likely cause?

a) Cytomegalovirus
b) Dengue virus
c) Hepatitis A virus
d) Rotavirus
e) Yellow fever virus

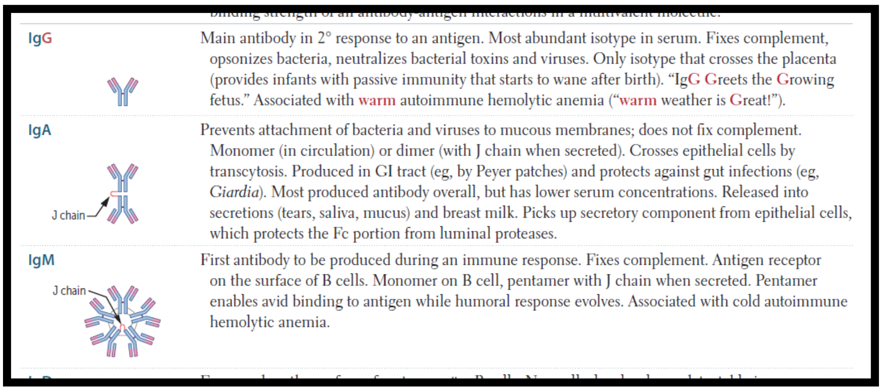
Key: a

Intranuclear = CMV + HSV
Intracytoplasmic = Molluscum cont + Rabies

831. Which one of the immunoglobulins BEST fits the following description: It is found in plasma as a dimer with a J chain. As it passes through mucosal cells, it acquires a secretory piece that protects it from degradation by proteases.

a) IgM
b) IgG
c) IgA
d) IgD
e) IgE

Key: c


J chain
J chain

IgG	Main antibody in 2° response to an antigen. Most abundant isotype in serum. Fixes complement, opsonizes bacteria, neutralizes bacterial toxins and viruses. Only isotype that crosses the placenta (provides infants with passive immunity that starts to wane after birth). "IgG Greets the Growing fetus." Associated with warm autoimmune hemolytic anemia ("warm weather is Great!").
IgA	Prevents attachment of bacteria and viruses to mucous membranes; does not fix complement. Monomer (in circulation) or dimer (with J chain when secreted). Crosses epithelial cells by transcytosis. Produced in GI tract (eg, by Peyer patches) and protects against gut infections (eg, *Giardia*). Most produced antibody overall, but has lower serum concentrations. Released into secretions (tears, saliva, mucus) and breast milk. Picks up secretory component from epithelial cells, which protects the Fc portion from luminal proteases.
IgM	First antibody to be produced during an immune response. Fixes complement. Antigen receptor on the surface of B cells. Monomer on B cell, pentamer with J chain when secreted. Pentamer enables avid binding to antigen while humoral response evolves. Associated with cold autoimmune hemolytic anemia.

832. Mycobacterium tuberculosis (MTB) and Mycobacterium avium-complex (MAC) are important causes of disease, especially in immunocompromised patients. (MAC is also known as Mycobacterium avium-intracellulare.) Regarding MTB and MAC, which one of the following statements is the MOST accurate?

a) Cell-mediated immunity is the most important host defense mechanism against MTB, whereas antibodymediated immunity is the most important host defense mechanism against MAC.
b) In the clinical laboratory, MAC can be distinguished from MTB by the fact that MAC forms colonies in 7 days, whereas MTB does not.
c) Multidrug-resistant strains of MAC are much less common than multidrug-resistant strains of MTB.
d) MAC is found in the environment and is not transmitted from person to person, whereas MTB is found in humans and is transmitted from person to person.

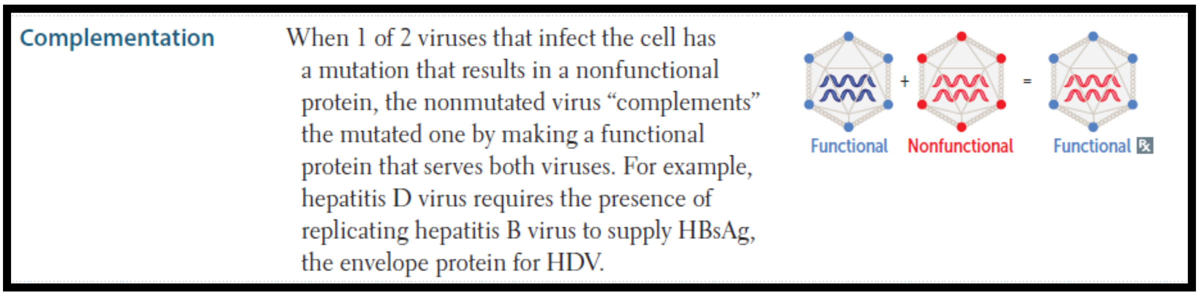
Key: d

833. In the laboratory, a virologist was studying the properties of mutant viruses. When she infected cells with mutant virus #1, no progeny viruses were produced. When she infected cells with mutant virus #2, no progeny viruses were produced. But when she infected cells with both mutant virus #1 and mutant virus #2, progeny viruses of both virus #1 and virus #2 were produced. Which one of the following is the term that BEST describes this phenomenon?

a) Phenotypic mixing
b) Complementation
c) Reassortment
d) Recombination

Key: b

In short, complementation is when one virus provides something that the other virus lacks, allowing both to complete their replication processes.


+
=
Functional
Nonfunctional
Functional

Complementation	When 1 of 2 viruses that infect the cell has a mutation that results in a nonfunctional protein, the nonmutated virus "complements" the mutated one by making a functional protein that serves both viruses. For example, hepatitis D virus requires the presence of replicating hepatitis B virus to supply HBsAg, the envelope protein for HDV.

834. Endotoxin is an important underlying cause of septic shock and death, especially in hospitalized patients. Regarding endotoxin, which one of the following is the MOST accurate?

a) It acts by phosphorylating the G stimulating protein.
b) It is a polypeptide with an A-B subunit configuration.
c) It induces the synthesis of tumor necrosis factor.
d) It is found primarily in gram-positive rods.
e) It can be treated with formaldehyde to form an effective toxoid vaccine.

Key: c

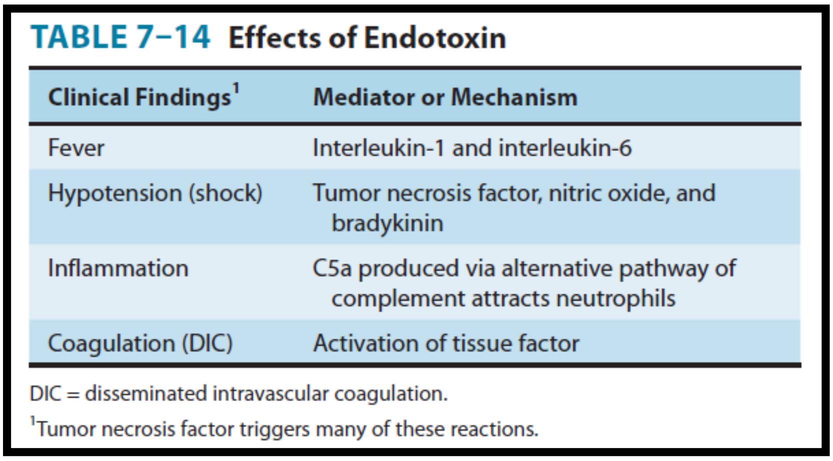


TABLE 7–14 Effects of Endotoxin

Clinical Findings[1]	Mediator or Mechanism
Fever	Interleukin-1 and interleukin-6
Hypotension (shock)	Tumor necrosis factor, nitric oxide, and bradykinin
Inflammation	C5a produced via alternative pathway of complement attracts neutrophils
Coagulation (DIC)	Activation of tissue factor

DIC = disseminated intravascular coagulation.

[1] Tumor necrosis factor triggers many of these reactions.

835. 12-year-old girl had a seizure this morning and was rushed to the hospital. On examination, her temperature was 40°C, and she had no nuchal rigidity. Computed tomography (CT) scan revealed no abnormality. A spinal tap was done, and the protein and glucose were normal. Gram stain of the spinal fluid showed no organisms and no polys. She was treated with various antibiotics but became comatose and died 2 days later. The routine blood culture and spinal fluid culture grew no organism. On autopsy of the brain, eosinophilic inclusion bodies were seen in the cytoplasm of neurons. Of the following, which one is the MOST likely cause?

a) Prions
b) JC virus
c) Rabies virus
d) Parvovirus B19
e) Herpes simplex virus type 1

Key: c

Intranuclear = HSV and CMV
Intra cytoplasmic= Rabies / Molluscum

836. A 70-year-old woman presents with rapid onset of fever to 39°C and a cough productive of greenish sputum. She is not hospitalized and not immunocompromised. A chest X-ray reveals a left lower lobe infiltrate. Of the following, which set of findings describes the MOST likely causative organism found in the sputum culture?

a) Gram-positive diplococci that form an a-hemolytic colony
b) Gram-negative diplococci that form an oxidase-positive colony
c) Gram-positive rods that form a b-hemolytic colony
d) Gram-negative rods that form an oxidase-positive colony
e) Gram-negative cocci that grow only anaerobically

Key: a (DON'T BE MISLEAD BY GREENISH SPUTUM)

837. Regarding the function of chemokines in host defenses, which one of the following is the MOST accurate?

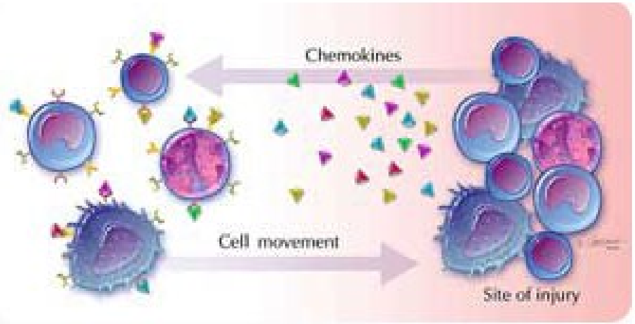
a) Chemokines bind to the T-cell receptor outside of the antigen-binding site and activate many T cells.
b) Chemokines induce gene switching in B cells that increases the amount of IgE synthesized, thereby predisposing to allergies.
c) Chemokines penetrate the membranes of target cells during attack by cytotoxic T cells.
d) Chemokines attract neutrophils to the site of bacterial infection, thereby playing a role in the inflammatory response.

Key: d

838. Which one of the following answer choices consists of bacteria, BOTH of which produce exotoxins that act by ADP-ribosylation? PAANI /// EDEMA

a) Salmonella typhi and Vibrio cholera
b) Vibrio cholerae and Corynebacterium diphtheria
c) Salmonella typhi and Clostridium perfringens
d) Corynebacterium diphtheriae and Staphylococcus aureus
e) Clostridium perfringens and Streptococcus pyogenes

Key: b



839. Regarding hepatitis C virus (HCV) and hepatitis D virus (HDV), which one of the following is MOST accurate?

a) HCV is transmitted by blood, but HDV is not.
b) More than half of HCV infections result in a chronic carrier state.
c) There is an effective vaccine against HCV but not against HDV.
d) Both HCV and HDV are defective RNA viruses and require concurrent HBV infection to replicate.

Key: b

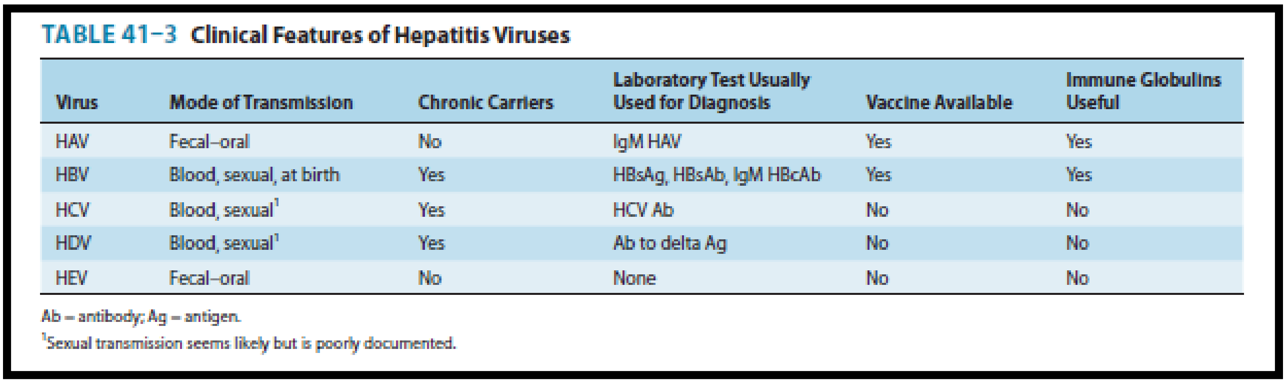


TABLE 41–3 Clinical Features of Hepatitis Viruses

Virus	Mode of Transmission	Chronic Carriers	Laboratory Test Usually Used for Diagnosis	Vaccine Available	Immune Globulins Useful
HAV	Fecal–oral	No	IgM HAV	Yes	Yes
HBV	Blood, sexual, at birth	Yes	HBsAg, HBsAb, IgM HBcAb	Yes	Yes
HCV	Blood, sexual[1]	Yes	HCV Ab	No	No
HDV	Blood, sexual[1]	Yes	Ab to delta Ag	No	No
HEV	Fecal–oral	No	None	No	No

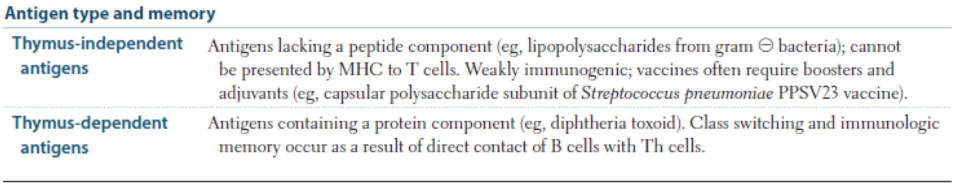
Ab = antibody; Ag = antigen.

[1] Sexual transmission seems likely but is poorly documented.

840. Which one of the following is MOST likely to induce an IgM antibody response without the participation of helper T cells?

(A) Bacterial capsular polysaccharide
(B) Toxic shock syndrome toxin
(C) Penicillin–bovine serum albumin (BSA) complex
(D) Tetanus toxoid

Key: a

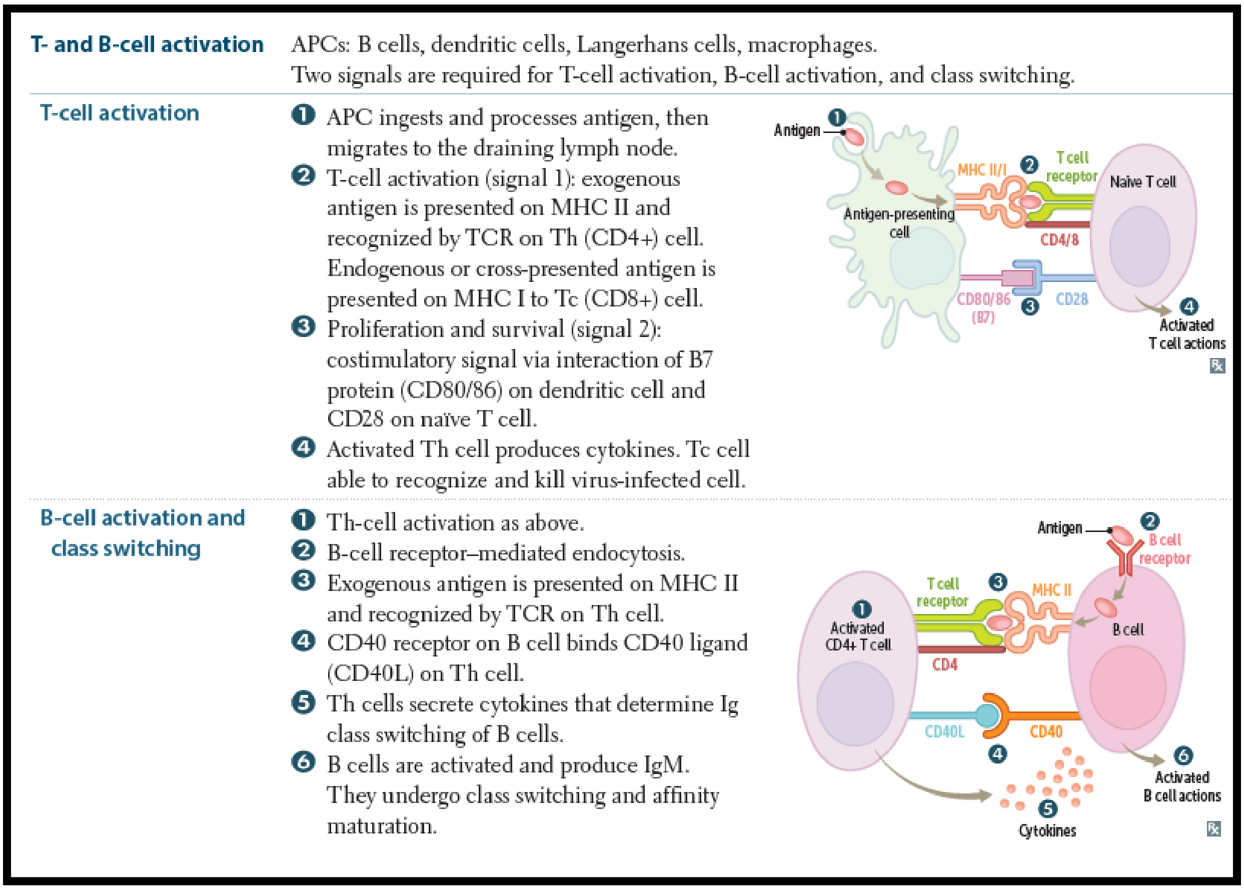


Antigen type and memory	
Thymus-independent antigens	Antigens lacking a peptide component (eg, lipopolysaccharides from gram ⊖ bacteria); cannot be presented by MHC to T cells. Weakly immunogenic; vaccines often require boosters and adjuvants (eg, capsular polysaccharide subunit of *Streptococcus pneumoniae* PPSV23 vaccine).
Thymus-dependent antigens	Antigens containing a protein component (eg, diphtheria toxoid). Class switching and immunologic memory occur as a result of direct contact of B cells with Th cells.

TI antigens, like bacterial polysaccharides or lipopolysaccharides, do not contain protein or peptide parts. Since they lack peptides, they cannot be shown to T cells using the MHC molecules on antigen-presenting cells.

These antigens directly activate B cells without needing help from T cells. This is why they are called "thymus-independent"

Without T helper cells, B cells are primarily stimulated to produce IgM antibodies, the default antibody type. Class switching to other antibody types (like IgG, IgA, or IgE) requires signals from T helper cells (via cytokines and CD40-CD40L interaction).
IgM is effective initially but does not provide long-term immunity like IgG.



T- and B-cell activation	APCs: B cells, dendritic cells, Langerhans cells, macrophages. Two signals are required for T-cell activation, B-cell activation, and class switching.
T-cell activation	❶ APC ingests and processes antigen, then migrates to the draining lymph node. ❷ T-cell activation (signal 1): exogenous antigen is presented on MHC II and recognized by TCR on Th (CD4+) cell. Endogenous or cross-presented antigen is presented on MHC I to Tc (CD8+) cell. ❸ Proliferation and survival (signal 2): costimulatory signal via interaction of B7 protein (CD80/86) on dendritic cell and CD28 on naïve T cell. ❹ Activated Th cell produces cytokines. Tc cell able to recognize and kill virus-infected cell.
B-cell activation and class switching	❶ Th-cell activation as above. ❷ B-cell receptor–mediated endocytosis. ❸ Exogenous antigen is presented on MHC II and recognized by TCR on Th cell. ❹ CD40 receptor on B cell binds CD40 ligand (CD40L) on Th cell. ❺ Th cells secrete cytokines that determine Ig class switching of B cells. ❻ B cells are activated and produce IgM. They undergo class switching and affinity maturation.

841. An outbreak of sepsis caused by Staphylococcus aureus has occurred in the newborn nursery. You are called upon to investigate. According to your knowledge of the normal flora, what is the MOST likely source of the organism?

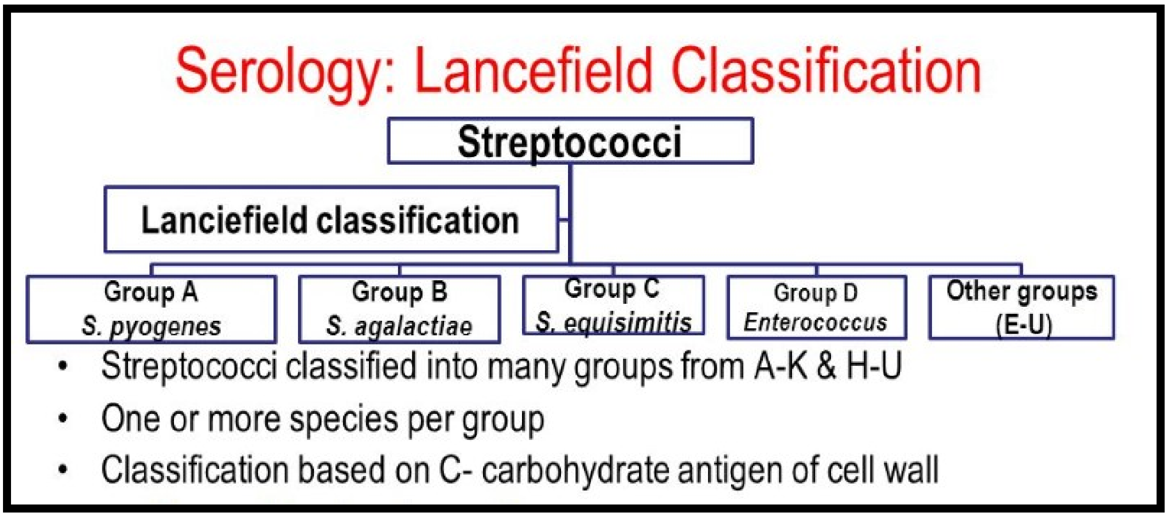
(A) Colon
(B) Nose
(C) Throat
(D) Vagina

Key: b

842. Each of the statements about the classification of streptococci is correct EXCEPT:

a. Pneumococci (Streptococcus pneumoniae) are α-hemolytic and can be serotyped on the basis of their polysaccharide capsules.
b. Enterococci are group D streptococci and can be classified by their ability to grow in 6.5% sodium chloride.
c. Although pneumococci and the viridans streptococci are α-hemolytic, they can be differentiated by the bile solubility test and their susceptibility to optochin.
d. Viridans streptococci are identified by Lancefield grouping, which is based on the C carbohydrate in the cell wall.

Key CORRECTED = D



Serology: Lancefield Classification

Streptococci

Lanciefield classification

Group A
S. pyogenes

Group B
S. agalactiae

Group C
S. equisimitis

Group D
Enterococcus

Other groups
(E-U)

- Streptococci classified into many groups from A-K & H-U
- One or more species per group
- Classification based on C- carbohydrate antigen of cell wall

843. Each of the following agents is a recognized cause of diarrhea EXCEPT:
(A) Clostridium perfringens
(B) Enterococcus faecalis
(C) Escherichia coli
(D) Vibrio cholerae
Key b

844. Each of the following organisms is an important cause of urinary tract infections EXCEPT:
(A) Escherichia coli
(B) Proteus mirabilis
(C) Klebsiella pneumoniae
(D) Bacteroides fragilis
Key d

845. Your patient is a 30-year-old woman with nonbloody diarrhea for the past 14 hours. Which one of the following organisms is LEAST likely to cause this illness?
(A) Clostridium difficile
(B) Streptococcus pyogenes
(C) Shigella dysenteriae
(D) Salmonella enteritidis
Key b

846. Each of the following statements concerning Mycobacterium tuberculosis is correct EXCEPT:
(A) After being stained with carbolfuchsin, M. tuberculosis resists decolorization with acid alcohol.
(B) Mycobacterium tuberculosis has a large amount of mycolic acid in its cell wall.
(C) Mycobacterium tuberculosis appears as a red rod in Gram stained specimens.
(D) Mycobacterium tuberculosis appears as a red rod in acid-fast stained specimens.
Key c

847. A 50-year-old homeless alcoholic has a fever and is coughing up 1 cup of green, foul-smelling sputum per day. You suspect that he may have a lung abscess. Which one of the following pairs of organisms is MOST likely to be the cause?
(A) Listeria monocytogenes and Legionella pneumophila
(B) Nocardia asteroides and Mycoplasma pneumoniae
(C) Fusobacterium nucleatum and Peptostreptococcus intermedius
(D) Clostridium perfringens and Chlamydia psittaci
Key c

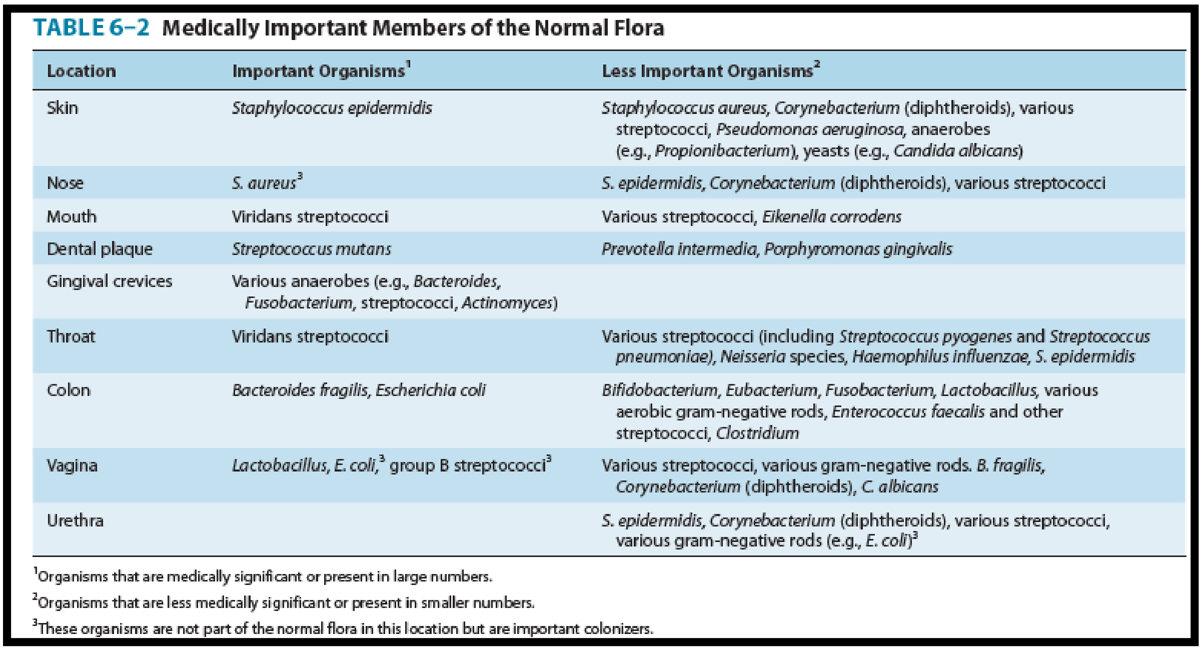


TABLE 6–2 Medically Important Members of the Normal Flora

Location	Important Organisms[1]	Less Important Organisms[2]
Skin	*Staphylococcus epidermidis*	*Staphylococcus aureus, Corynebacterium* (diphtheroids), various streptococci, *Pseudomonas aeruginosa*, anaerobes (e.g., *Propionibacterium*), yeasts (e.g., *Candida albicans*)
Nose	*S. aureus*[3]	*S. epidermidis, Corynebacterium* (diphtheroids), various streptococci
Mouth	Viridans streptococci	Various streptococci, *Eikenella corrodens*
Dental plaque	*Streptococcus mutans*	*Prevotella intermedia, Porphyromonas gingivalis*
Gingival crevices	Various anaerobes (e.g., *Bacteroides, Fusobacterium*, streptococci, *Actinomyces*)	
Throat	Viridans streptococci	Various streptococci (including *Streptococcus pyogenes* and *Streptococcus pneumoniae*), *Neisseria* species, *Haemophilus influenzae, S. epidermidis*
Colon	*Bacteroides fragilis, Escherichia coli*	*Bifidobacterium, Eubacterium, Fusobacterium, Lactobacillus*, various aerobic gram-negative rods, *Enterococcus faecalis* and other streptococci, *Clostridium*
Vagina	*Lactobacillus, E. coli*,[3] group B streptococci[3]	Various streptococci, various gram-negative rods. *B. fragilis, Corynebacterium* (diphtheroids), *C. albicans*
Urethra		*S. epidermidis, Corynebacterium* (diphtheroids), various streptococci, various gram-negative rods (e.g., *E. coli*)[3]

[1] Organisms that are medically significant or present in large numbers.

[2] Organisms that are less medically significant or present in smaller numbers.

[3] These organisms are not part of the normal flora in this location but are important colonizers.

848. Your patient has subacute bacterial endocarditis caused by a member of the viridans group of streptococci. Which one of the following sites is MOST likely to be the source of the organism?

a. Skin
b. Colon
c. Oropharynx
d. Urethra

Key c

849. A culture of skin lesions from a patient with pyoderma (impetigo) shows numerous colonies surrounded by a zone of β-hemolysis on a blood agar plate. A Gram-stained smear shows gram positive cocci. If you found the catalase test to be negative, which one of the following organisms would you MOST probably have isolated?

(A) Streptococcus pyogenes
(B) Staphylococcus aureus
(C) Staphylococcus epidermidis
(D) Streptococcus pneumoniae

Key a

850. The coagulase test, in which the bacteria cause plasma to clot, is used to distinguish:

(A) Streptococcus pyogenes from Enterococcus faecalis
(B) Streptococcus pyogenes from Staphylococcus aureus
(C) Staphylococcus aureus from Staphylococcus epidermidis
(D) Staphylococcus epidermidis from Neisseria meningitidis

Key c

851. Which one of the following is a virulence factor for Staphylococcus aureus?

(A) A heat-labile toxin that inhibits glycine release at the internuncial neuron
(B) An oxygenlabile hemolysin
(C) Resistance to novobiocin
(D) Protein A that binds to the Fc portion of IgG

Key d

852. Which one of the following host defense mechanisms is the MOST important for preventing dysentery caused by Salmonella?

(A) Gastric acid
(B) Salivary enzymes
(C) Normal flora of the mouth
(D) Alpha interferon

Key a

853. The MOST important protective function of the antibody stimulated by tetanus immunization is:

(A) To opsonize the pathogen (Clostridium tetani)
(B) To prevent growth of the pathogen
(C) To prevent adherence of the pathogen
(D) To neutralize the toxin of the pathogen
Key d

854. Five hours after eating reheated rice at a restaurant, a 24-yearold woman and her husband both developed nausea, vomiting, and diarrhea. Which one of the following organisms is the MOST likely to be involved?

(A) Clostridium perfringens
(B) Enterotoxigenic Escherichia coli
(C) Bacillus cereus
(D) Salmonella typhi
Key c

855. Which one of the following bacteria has the LOWEST 50% infectious dose (ID50)?

(A) Shigella sonnei
(B) Vibrio cholerae
(C) Salmonella typhi
(D) Campylobacter jejuni
Key a

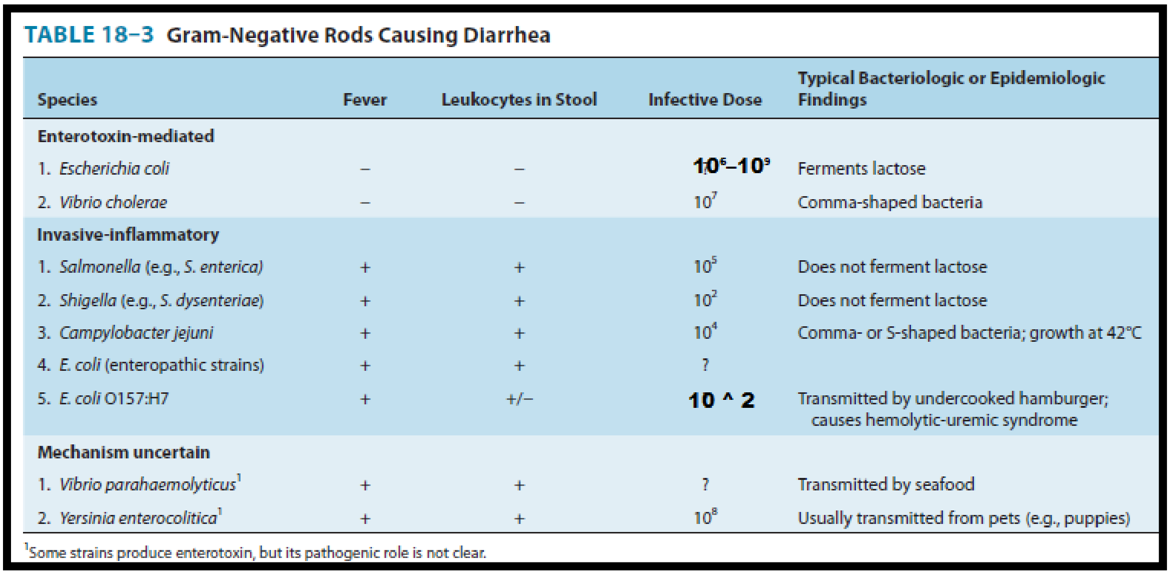


TABLE 18–3 **Gram-Negative Rods Causing Diarrhea**

Species	Fever	Leukocytes in Stool	Infective Dose	Typical Bacteriologic or Epidemiologic Findings
Enterotoxin-mediated				
1. *Escherichia coli*	–	–	10^6–10^9	Ferments lactose
2. *Vibrio cholerae*	–	–	10^7	Comma-shaped bacteria
Invasive-inflammatory				
1. *Salmonella* (e.g., *S. enterica*)	+	+	10^5	Does not ferment lactose
2. *Shigella* (e.g., *S. dysenteriae*)	+	+	10^2	Does not ferment lactose
3. *Campylobacter jejuni*	+	+	10^4	Comma- or S-shaped bacteria; growth at 42°C
4. *E. coli* (enteropathic strains)	+	+	?	
5. *E. coli* O157:H7	+	+/–	10 ^ 2	Transmitted by undercooked hamburger; causes hemolytic-uremic syndrome
Mechanism uncertain				
1. *Vibrio parahaemolyticus*[1]	+	+	?	Transmitted by seafood
2. *Yersinia enterocolitica*[1]	+	+	10^8	Usually transmitted from pets (e.g., puppies)

[1] Some strains produce enterotoxin, but its pathogenic role is not clear.

856. For which one of the following enteric illnesses is a chronic carrier state MOST likely to develop?

(A) Campylobacter enterocolitis
(B) Shigella enterocolitis
(C) Cholera
(D) Typhoid fever
Key d

857. Which one of the following zoonotic illnesses has NO arthropod vector?

(A) Plague
(B) Lyme disease
(C) Brucellosis
(D) Epidemic typhus
Key c

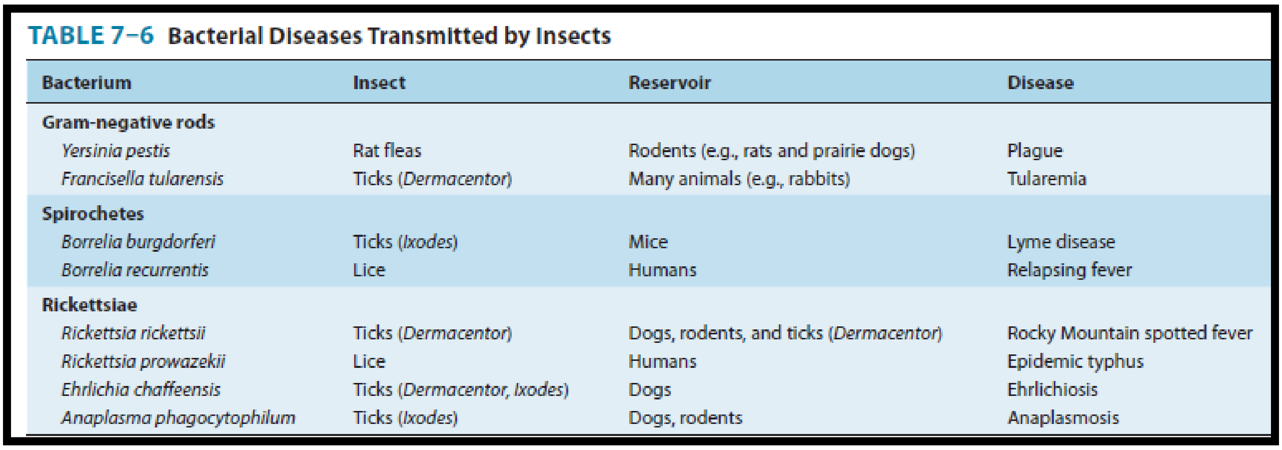


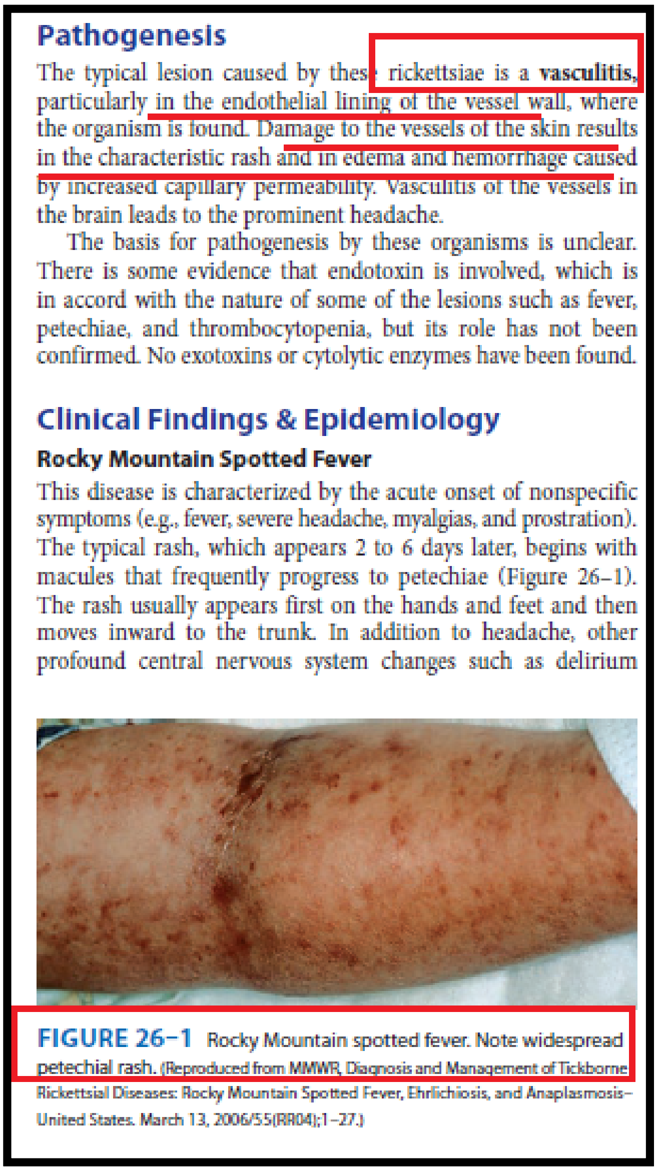
TABLE 7–6 Bacterial Diseases Transmitted by Insects

Bacterium	Insect	Reservoir	Disease
Gram-negative rods			
Yersinia pestis	Rat fleas	Rodents (e.g., rats and prairie dogs)	Plague
Francisella tularensis	Ticks (*Dermacentor*)	Many animals (e.g., rabbits)	Tularemia
Spirochetes			
Borrelia burgdorferi	Ticks (*Ixodes*)	Mice	Lyme disease
Borrelia recurrentis	Lice	Humans	Relapsing fever
Rickettsiae			
Rickettsia rickettsii	Ticks (*Dermacentor*)	Dogs, rodents, and ticks (*Dermacentor*)	Rocky Mountain spotted fever
Rickettsia prowazekii	Lice	Humans	Epidemic typhus
Ehrlichia chaffeensis	Ticks (*Dermacentor*, *Ixodes*)	Dogs	Ehrlichiosis
Anaplasma phagocytophilum	Ticks (*Ixodes*)	Dogs, rodents	Anaplasmosis

858. Which one of the following organisms principally infects vascular endothelial cells and as a result often causes a petechial rash?

(A) Salmonella typhi
(B) Rickettsia rickettsii
(C) Haemophilus influenzae
(D) Coxiella burnetii

Key b



Pathogenesis

The typical lesion caused by these rickettsiae is a **vasculitis,** particularly in the endothelial lining of the vessel wall, where the organism is found. Damage to the vessels of the skin results in the characteristic rash and in edema and hemorrhage caused by increased capillary permeability. Vasculitis of the vessels in the brain leads to the prominent headache.

The basis for pathogenesis by these organisms is unclear. There is some evidence that endotoxin is involved, which is in accord with the nature of some of the lesions such as fever, petechiae, and thrombocytopenia, but its role has not been confirmed. No exotoxins or cytolytic enzymes have been found.

Clinical Findings & Epidemiology

Rocky Mountain Spotted Fever

This disease is characterized by the acute onset of nonspecific symptoms (e.g., fever, severe headache, myalgias, and prostration). The typical rash, which appears 2 to 6 days later, begins with macules that frequently progress to petechiae (Figure 26–1). The rash usually appears first on the hands and feet and then moves inward to the trunk. In addition to headache, other profound central nervous system changes such as delirium

FIGURE 26–1 Rocky Mountain spotted fever. Note widespread petechial rash. (Reproduced from MMWR, Diagnosis and Management of Tickborne Rickettsial Diseases: Rocky Mountain Spotted Fever, Ehrlichiosis, and Anaplasmosis–United States. March 13, 2006/55(RR04);1–27.)

859. Which one of the following statements MOST accurately depicts the ability of the organism to be cultured in the laboratory?

a) Treponema pallidum from a chancre can be grown on a special artificial medium supplemented with cholesterol.
b) Mycobacterium leprae can be grown in the armadillo and the mouse footpad but not on any artificial media.
c) Mycobacterium tuberculosis can be grown on enriched artificial media and produces visible colonies in 48 to 96 hours.
d) Atypical mycobacteria are found widely in soil and water but cannot be cultured on artificial media in the laboratory.

Key b

860. A 2 years old boy who missed several scheduled immunizations presented to emergency room with a high grade fever, irritability and a stiff neck. Spinal tap was performed which yielded 20,000 WBCs per ml with 85 % nuetrophilia. Gram stain revealed small pleomorphic GNRs that grow only on chocolate agar. If an inhibitor is designed to block major virulence factor/s of this isolate, which of the following is it most likely to be;

a. IgA proteases synthesis
b. Capsule synthesis
c. Endotoxin assembly
d. Flagella synthesis
e. Exotoxin liberator

Key b (DON'T GET CONFUSED BETWEEN OPTION A AND B)

861. A 30 years old male patient presented with a 2 week history of a painless penile ulcer. Lab reports that his VDRL is reactive at a dilution of 1:4. Patient also told you that he was recently diagnosed and treated for Hep A. Which of the following is most appropriate next step;

a. Order a repeat VDRL
b. Order RPR test
c. Order a confirmatory test like TPHA, FTAbs
d. Perform a spinal tap to rule out CNS syphilus
e. Proceed patient as a diagnosed case of syphilus

Key c

862. A 9 years old boy presented with complaint of painful axillary lymphadenopathy. Boy also has a small inflamed lesion on his right forearm, which appears to be a small scratch. Silver impregnation staining of fluid aspiate from the lymph node revealed pleomorphic rod shaped bacteria. which of the following is the most likely cause;

a. Brucella canis
b. Mycobacterium scrofulaceum
c. Yersinia pestis
d. Bartonella henselae

Key d

- **The painful axillary lymphadenopathy along with a small inflamed scratch on the forearm is highly suggestive of Cat Scratch Disease (CSD) caused by *Bartonella henselae*.**
- ***Bartonella henselae* is a pleomorphic, gram-negative rod that can be detected using silver impregnation staining (Warthin-Starry stain), which is a diagnostic clue in this case.**
- **Cat Scratch Disease typically occurs after a scratch or bite from a cat, and the bacteria localize to regional lymph nodes, causing painful lymphadenopathy.**

863. Which of the following organisms is transmitted by bite of a hard Ixodes tick, where circulating leukocytes are infected and morulae(clusters of micro-organisms) forms and which can be treated with Tetracyclines and rifampicin?

a. Ehrlichia chaffeensis
b. Chlamydia trachomatis
c. Coxiella burnetii
d. Rickettsia rickettsii

Key a

TABLE 7–6 Bacterial Diseases Transmitted by Insects

Bacterium	Insect	Reservoir	Disease
Gram-negative rods			
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Borrelia recurrentis	Lice	Humans	Relapsing fever
Rickettsiae			
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Rickettsia prowazekii	Lice	Humans	Epidemic typhus
Ehrlichia chaffeensis	Ticks (*Dermacentor, Ixodes*)	Dogs	Ehrlichiosis
Anaplasma phagocytophilum	Ticks (*Ixodes*)	Dogs, rodents	Anaplasmosis

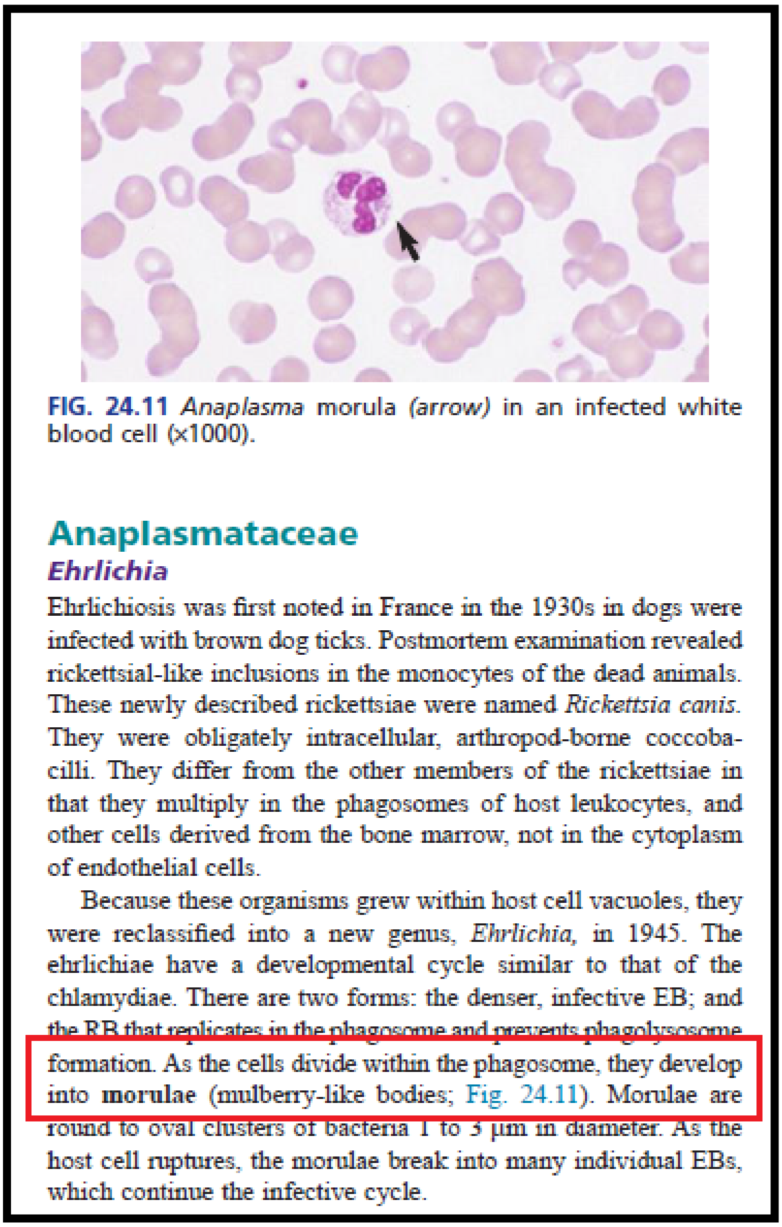


FIG. 24.11 *Anaplasma* morula *(arrow)* in an infected white blood cell (×1000).

Anaplasmataceae

Ehrlichia

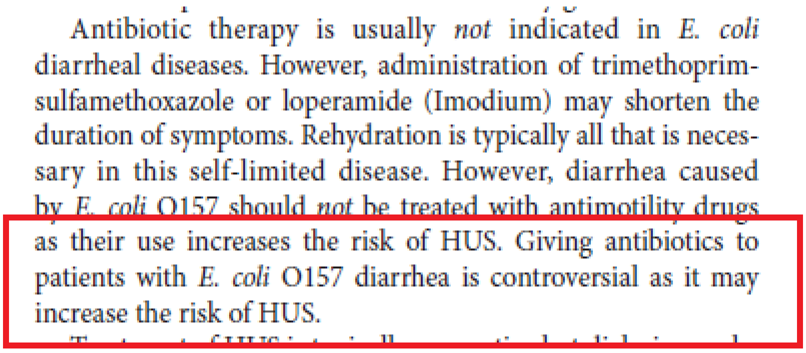
Ehrlichiosis was first noted in France in the 1930s in dogs were infected with brown dog ticks. Postmortem examination revealed rickettsial-like inclusions in the monocytes of the dead animals. These newly described rickettsiae were named *Rickettsia canis*. They were obligately intracellular, arthropod-borne coccobacilli. They differ from the other members of the rickettsiae in that they multiply in the phagosomes of host leukocytes, and other cells derived from the bone marrow, not in the cytoplasm of endothelial cells.

Because these organisms grew within host cell vacuoles, they were reclassified into a new genus, *Ehrlichia*, in 1945. The ehrlichiae have a developmental cycle similar to that of the chlamydiae. There are two forms: the denser, infective EB; and the RB that replicates in the phagosome and prevents phagolysosome formation. As the cells divide within the phagosome, they develop into **morulae** (mulberry-like bodies; Fig. 24.11). Morulae are round to oval clusters of bacteria 1 to 3 μm in diameter. As the host cell ruptures, the morulae break into many individual EBs, which continue the infective cycle.

864. Acute gastroenteritis with which of the following agents is not treated with antibiotics;

a) Clostridium difficile
b) Eschirichia coli O157:H7
c) Salmonella spp.
d) Vibrio cholera

Key CORRECTED = B



Antibiotic therapy is usually *not* indicated in *E. coli* diarrheal diseases. However, administration of trimethoprim-sulfamethoxazole or loperamide (Imodium) may shorten the duration of symptoms. Rehydration is typically all that is necessary in this self-limited disease. However, diarrhea caused by *E. coli* O157 should *not* be treated with antimotility drugs as their use increases the risk of HUS. Giving antibiotics to patients with *E. coli* O157 diarrhea is controversial as it may increase the risk of HUS.

865. A 63 years old patient being treated with broad spectrum antimicrobials develops endoscopically observed microabcesses and diarrhea. Which of the following is the therapy of choice for him;

a. Ampicillin
b. Erythromycin
c. Penicillin
d. Vancomycin

Key d

The patient has diarrhea and micro abscesses observed during endoscopy after receiving broad-spectrum antimicrobials. This is highly suggestive of Clostridium difficile infection (CDI), often referred to as antibiotic-associated colitis.

866. A 60 years old female on peritoneal dialysis developed fever and tenderness around her peritoneal catheter. Her blood cultures yielded growth of Gram positive cocci. Which of the following is the most likely organism;

a. Streptococcus pyogenes
b. Streptococcus pneumoniae
c. Staphylococcus epidermidis
d. Viridans Streptococci

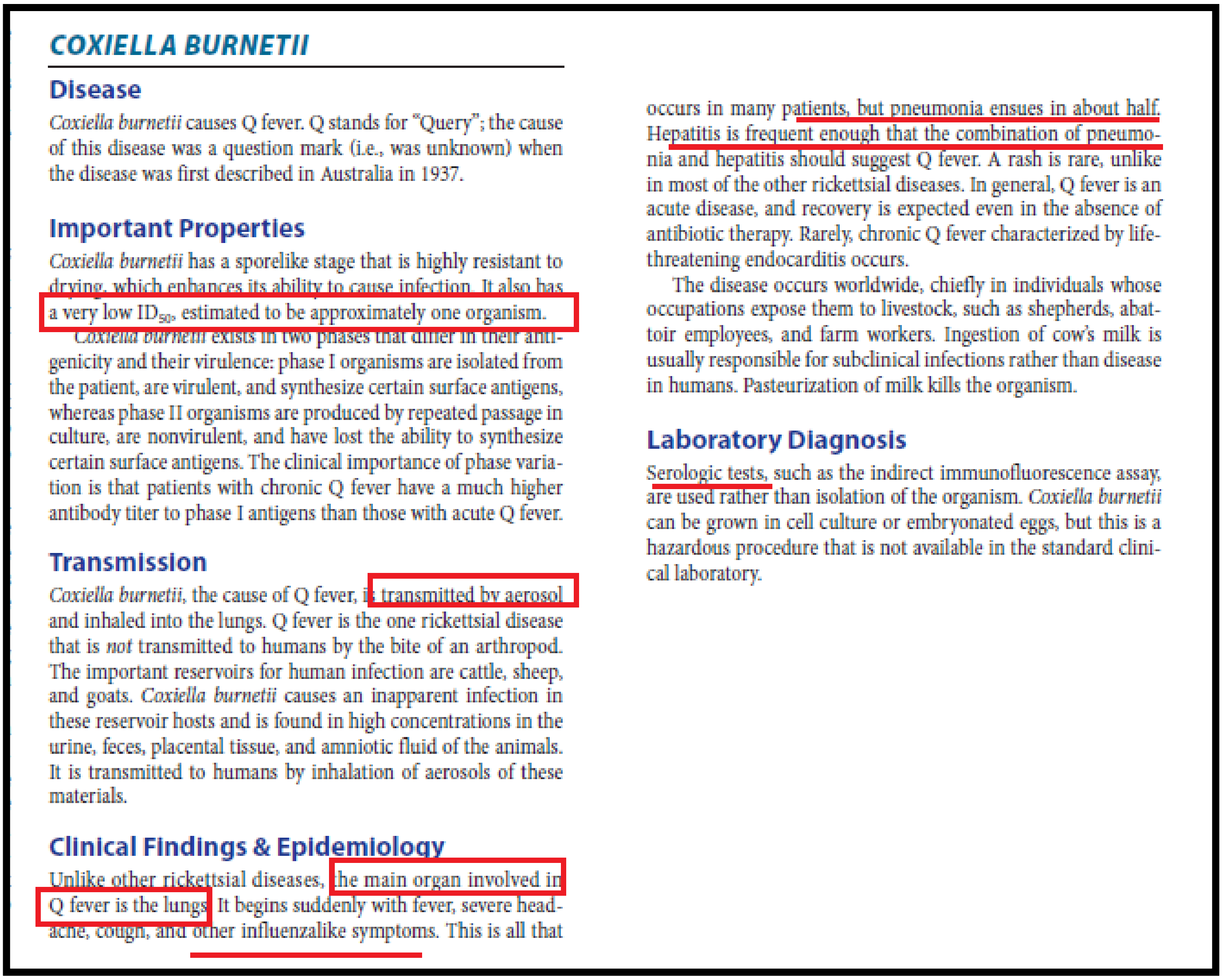
Key c

***Staphylococcus epidermidis* is a Gram-positive cocci and part of the normal skin flora. It commonly causes catheter-associated infections in patients with indwelling medical devices, such as catheters and shunts, by forming biofilms that help it persist and evade immune responses and antibiotic treatment.**

867. A 30 years old man presented with sudden influenza like symptoms. He works at a slaughterhouse and severalof his coworkers have similar symptoms. On X Rays chest early features of pneumonia were also observed. What is the most likely etiologic organism;

a. Coxiella burnetii
b. Rickettsia rickettciae
c. Brucella abortus
d. Tenia solium

Key a



COXIELLA BURNETII

Disease

Coxiella burnetii causes Q fever. Q stands for "Query"; the cause of this disease was a question mark (i.e., was unknown) when the disease was first described in Australia in 1937.

Important Properties

Coxiella burnetii has a sporelike stage that is highly resistant to drying, which enhances its ability to cause infection. It also has a very low ID_{50}, estimated to be approximately one organism.

Coxiella burnetii exists in two phases that differ in their antigenicity and their virulence: phase I organisms are isolated from the patient, are virulent, and synthesize certain surface antigens, whereas phase II organisms are produced by repeated passage in culture, are nonvirulent, and have lost the ability to synthesize certain surface antigens. The clinical importance of phase variation is that patients with chronic Q fever have a much higher antibody titer to phase I antigens than those with acute Q fever.

Transmission

Coxiella burnetii, the cause of Q fever, is transmitted by aerosol and inhaled into the lungs. Q fever is the one rickettsial disease that is *not* transmitted to humans by the bite of an arthropod. The important reservoirs for human infection are cattle, sheep, and goats. *Coxiella burnetii* causes an inapparent infection in these reservoir hosts and is found in high concentrations in the urine, feces, placental tissue, and amniotic fluid of the animals. It is transmitted to humans by inhalation of aerosols of these materials.

Clinical Findings & Epidemiology

Unlike other rickettsial diseases, the main organ involved in Q fever is the lungs. It begins suddenly with fever, severe headache, cough, and other influenzalike symptoms. This is all that occurs in many patients, but pneumonia ensues in about half. Hepatitis is frequent enough that the combination of pneumonia and hepatitis should suggest Q fever. A rash is rare, unlike in most of the other rickettsial diseases. In general, Q fever is an acute disease, and recovery is expected even in the absence of antibiotic therapy. Rarely, chronic Q fever characterized by life-threatening endocarditis occurs.

The disease occurs worldwide, chiefly in individuals whose occupations expose them to livestock, such as shepherds, abattoir employees, and farm workers. Ingestion of cow's milk is usually responsible for subclinical infections rather than disease in humans. Pasteurization of milk kills the organism.

Laboratory Diagnosis

Serologic tests, such as the indirect immunofluorescence assay, are used rather than isolation of the organism. *Coxiella burnetii* can be grown in cell culture or embryonated eggs, but this is a hazardous procedure that is not available in the standard clinical laboratory.

868. 62 years old female patient was resdmitted with fever and chills following a cardic surgery a week earlier. A Gram positive coccus grows within 24 hours from her blood cultures. Isolate was Group D antigen positive and was resistant to Penicillin and Vancomycin. Which of the following is the treatment choice for this patient;

a. Gentamicin monotherapy
b. Rifampicin monotherapy
c. Gentamicin and Ampicillin
d. None of the above

Key d

For micro people:
According to Sanford Rx of VRE bacteremia = Daptomycin + Ampicillin/Ceftaroline OR Linezolid

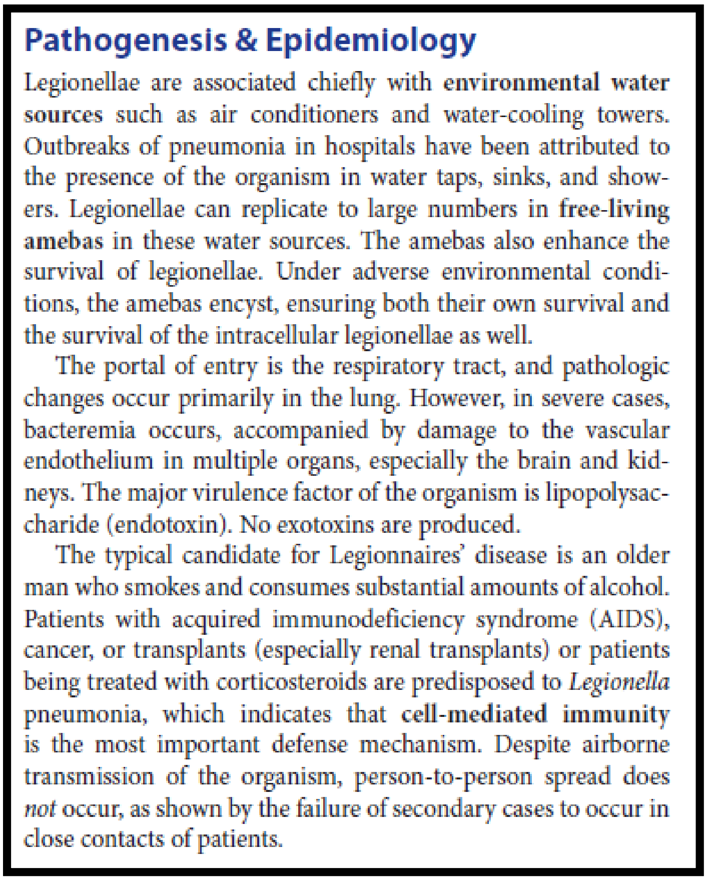
869. A patient presented with right foot vesicular swelling with history of minor abrasion on same foot a few days before while fishing in shallow waters near costal region of Karachi. Lesion evolved into vesicles & bullae and became necrotic within 18 hours of admission. Patient developed severe sepsis and multiorgan failure afterwards. Which of the following organism could be a possible reason;

a. Streptococcus pyogenes
b. Pseudomonas aeruginosa
c. Vibrio vulnificus
d. Vibrio parahaemolyticus

Key c

870. A 67-year-old diabetic woman is hospitalized with a 3-day history of fever, headache, diarrhea, dyspnea, and a cough productive of scant sputum. A chest radiograph reveals patchy, multilobar consolidation. No organisms are seen on sputum Gram stain; however, culture of sputum and blood on buffered charcoal yeast extract agar yielded few colonies. What is the source of infection for this patient

(A) Aerosolized spores from soil
(B) Aerosols from contaminated water
(C) Colonization of the upper airways
(D) Inapparent carrier of the organism
(E) Person with the same disease
Key b



Pathogenesis & Epidemiology

Legionellae are associated chiefly with **environmental water sources** such as air conditioners and water-cooling towers. Outbreaks of pneumonia in hospitals have been attributed to the presence of the organism in water taps, sinks, and showers. Legionellae can replicate to large numbers in **free-living amebas** in these water sources. The amebas also enhance the survival of legionellae. Under adverse environmental conditions, the amebas encyst, ensuring both their own survival and the survival of the intracellular legionellae as well.

The portal of entry is the respiratory tract, and pathologic changes occur primarily in the lung. However, in severe cases, bacteremia occurs, accompanied by damage to the vascular endothelium in multiple organs, especially the brain and kidneys. The major virulence factor of the organism is lipopolysaccharide (endotoxin). No exotoxins are produced.

The typical candidate for Legionnaires' disease is an older man who smokes and consumes substantial amounts of alcohol. Patients with acquired immunodeficiency syndrome (AIDS), cancer, or transplants (especially renal transplants) or patients being treated with corticosteroids are predisposed to *Legionella* pneumonia, which indicates that **cell-mediated immunity** is the most important defense mechanism. Despite airborne transmission of the organism, person-to-person spread does *not* occur, as shown by the failure of secondary cases to occur in close contacts of patients.

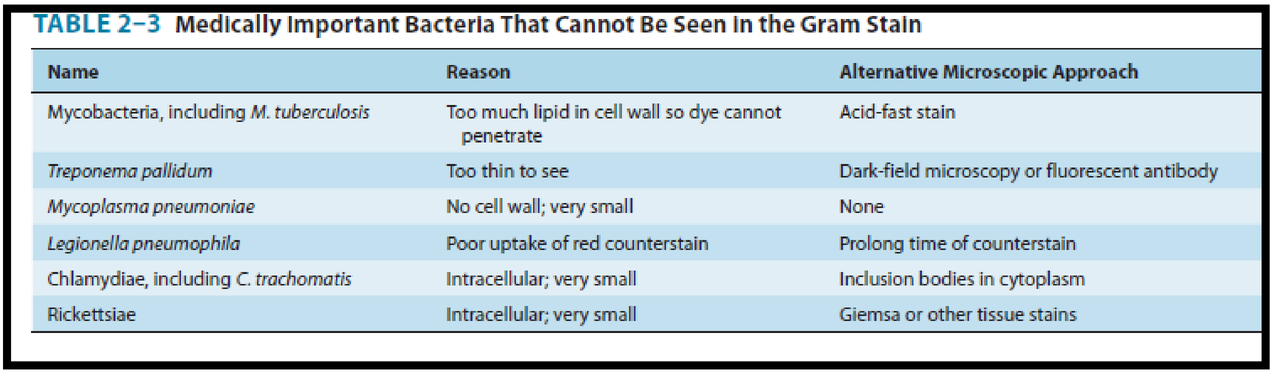


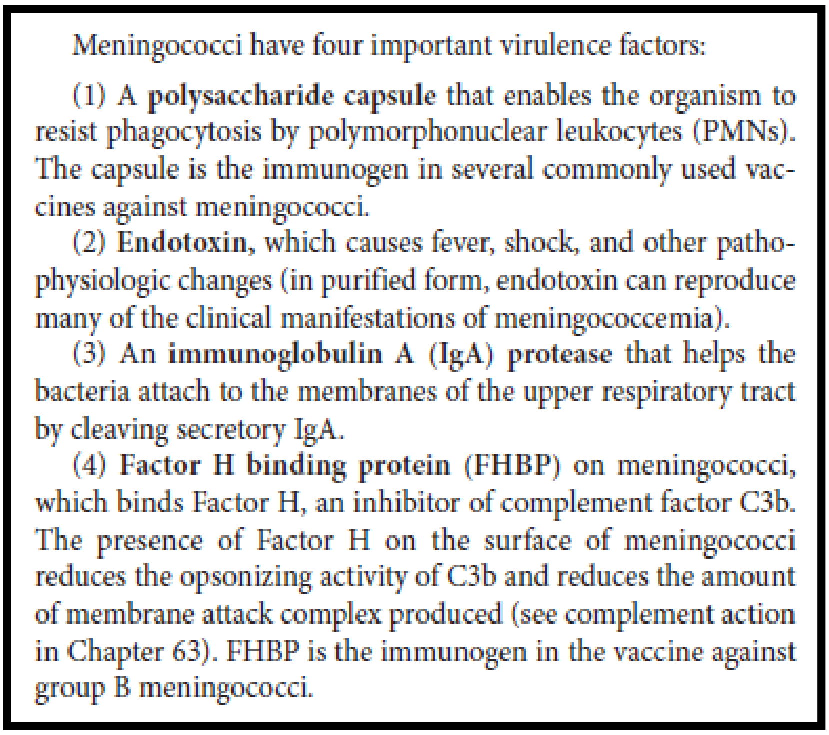
TABLE 2–3 Medically Important Bacteria That Cannot Be Seen in the Gram Stain

Name	Reason	Alternative Microscopic Approach
Mycobacteria, including *M. tuberculosis*	Too much lipid in cell wall so dye cannot penetrate	Acid-fast stain
Treponema pallidum	Too thin to see	Dark-field microscopy or fluorescent antibody
Mycoplasma pneumoniae	No cell wall; very small	None
Legionella pneumophila	Poor uptake of red counterstain	Prolong time of counterstain
Chlamydiae, including *C. trachomatis*	Intracellular; very small	Inclusion bodies in cytoplasm
Rickettsiae	Intracellular; very small	Giemsa or other tissue stains

871. A 5-year-old child died from severe septic shock, disseminated intravascular coagulation, and cardiac insufficiency following a sudden onset of fever, severe headache, and vomiting. The causative agent, a Gram-negative diplococcus, was isolated from blood and cerebrospinal fluid (CSF) on Thayer–Martin agar and was also identified in CSF by latex agglutination. What is the most important virulence factor involved in disease production by the etiologic agent in this case?

(A) Exotoxin production
(B) Flagella
(C) Lipopolysaccharide
(D) Pili
(E) Polysaccharide capsule

Key CORRECTED = E



Meningococci have four important virulence factors:

(1) A **polysaccharide capsule** that enables the organism to resist phagocytosis by polymorphonuclear leukocytes (PMNs). The capsule is the immunogen in several commonly used vaccines against meningococci.

(2) **Endotoxin,** which causes fever, shock, and other pathophysiologic changes (in purified form, endotoxin can reproduce many of the clinical manifestations of meningococcemia).

(3) An **immunoglobulin A (IgA) protease** that helps the bacteria attach to the membranes of the upper respiratory tract by cleaving secretory IgA.

(4) **Factor H binding protein** (FHBP) on meningococci, which binds Factor H, an inhibitor of complement factor C3b. The presence of Factor H on the surface of meningococci reduces the opsonizing activity of C3b and reduces the amount of membrane attack complex produced (see complement action in Chapter 63). FHBP is the immunogen in the vaccine against group B meningococci.

872. A 56-year-old renal transplant patient was hospitalized following an abrupt onset of high fever (39.6 °C), confusion, headache, diarrhea, a cough productive of scant sputum, and shortness of breath. His chemistry profile revealed hyponatremia. A chest radiograph showed lobar infiltrates. Gram stain of sputum showed numerous neutrophils but failed to show any organisms. A urine antigen test was positive for the causative agent. What is the major virulence factor of the causative agent?

(A) Antiphagocytic capsule
(B) Cord factor
(C) Exotoxin production
(D) Intracellular growth
(E) Pyocyanin
Key d

The clinical scenario described is consistent with Legionnaires' disease, caused by Legionella pneumophila.

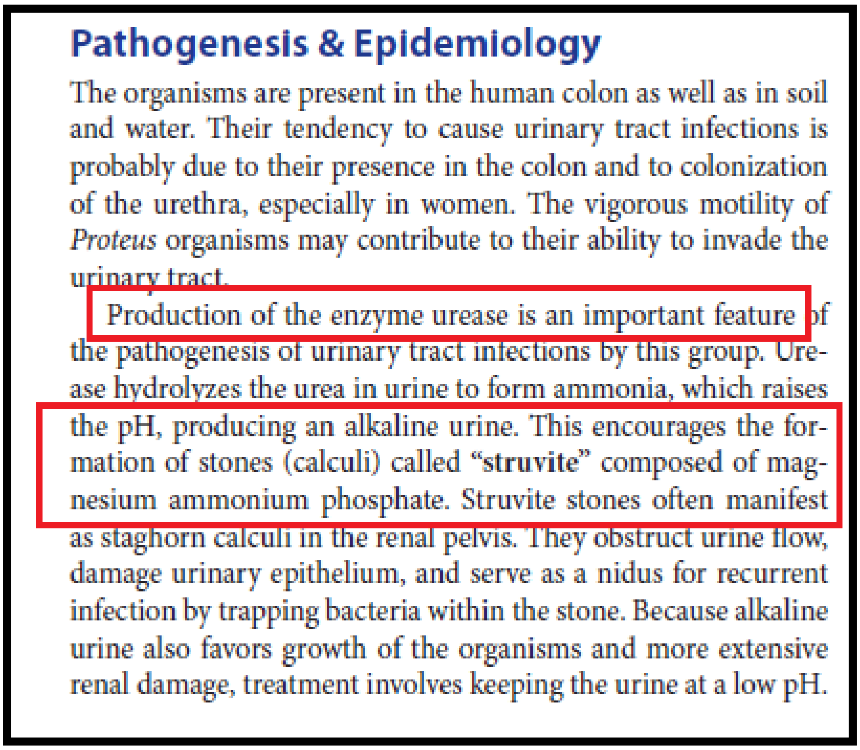
Urine Antigen = Legionella pneumophila serotype I

873. A 7-year-old female child is taken to an urgent care facility because of fever and periodic incontinence. The physician suspects a urinary tract infection. What is the most likely etiology of this child's infection?

a. Escherichia coli
b. Proteus mirabilis
c. Pseudomonas aeruginosa
d. Staphylococcus saprophyticus
e. Ureaplasma urealyticum
Key a

874. A 78-year-old hospitalized male with an indwelling catheter develops a new onset of fever. The urine sample has an alkaline pH. The bacterium isolated from the urine is a urease-producing, highly motile, Gram-negative bacillus. What is the most likely complication of this infection?

(A) Deposition of antigen–antibody complexes in the glomeruli
(B) Development of epididymitis
(C) Development of prostatitis
(D) Formation of struvite kidney stones
(E) Rapid dissemination throughout the body
Key d



Pathogenesis & Epidemiology

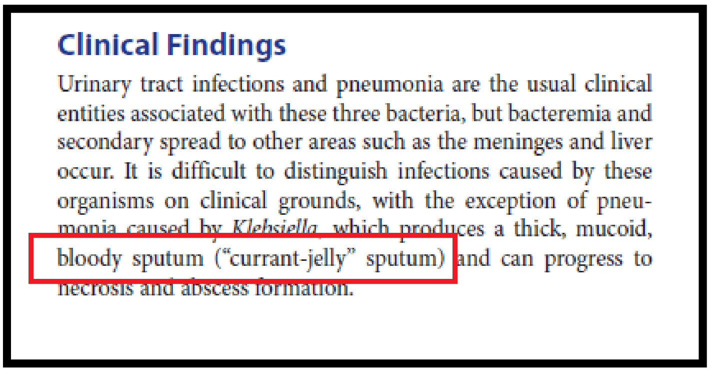
The organisms are present in the human colon as well as in soil and water. Their tendency to cause urinary tract infections is probably due to their presence in the colon and to colonization of the urethra, especially in women. The vigorous motility of *Proteus* organisms may contribute to their ability to invade the urinary tract.

Production of the enzyme urease is an important feature of the pathogenesis of urinary tract infections by this group. Urease hydrolyzes the urea in urine to form ammonia, which raises the pH, producing an alkaline urine. This encourages the formation of stones (calculi) called "**struvite**" composed of magnesium ammonium phosphate. Struvite stones often manifest as staghorn calculi in the renal pelvis. They obstruct urine flow, damage urinary epithelium, and serve as a nidus for recurrent infection by trapping bacteria within the stone. Because alkaline urine also favors growth of the organisms and more extensive renal damage, treatment involves keeping the urine at a low pH.

875. An 85-year-old male nursing home patient with a history of alcoholism suddenly developed a flu-like illness. He complained of chills and fever and had frequent coughing spells productive of thick, bloody sputum. The attending physician diagnosed bronchopneumonia and prescribed antibiotics, but regrettably the patient died within a week. What is the most likely cause of the patient's pneumonia?

a) Haemophilus influenzae
b) Klebsiella pneumoniae
c) Legionella pneumophila
d) Mycoplasma pneumoniae
e) Streptococcus pneumonia

Key b



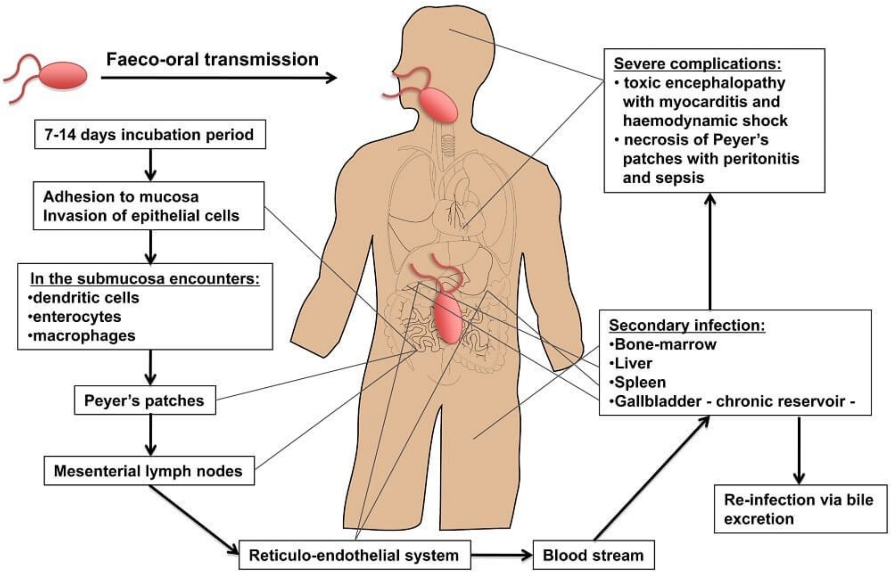
Clinical Findings

Urinary tract infections and pneumonia are the usual clinical entities associated with these three bacteria, but bacteremia and secondary spread to other areas such as the meninges and liver occur. It is difficult to distinguish infections caused by these organisms on clinical grounds, with the exception of pneumonia caused by *Klebsiella*, which produces a thick, mucoid, bloody sputum ("currant-jelly" sputum) and can progress to necrosis and abscess formation.

876. Fimbriae-mediated adherence to intestinal epithelial cells, type III secretion system-mediated endocytosis and transport to the lamina propria to elicit a localized inflammatory response are descriptive of the infectivity and pathogenesis of which diarrheogenic agent?

a) Campylobacter jejuni
b) Clostridium difficile
c) Enterotoxigenic Escherichia coli
d) Salmonella sp.
e) Vibrio cholera

Key d


Faeco-oral transmission
7-14 days incubation period
Adhesion to mucosa
Invasion of epithelial cells
In the submucosa encounters:
•dendritic cells
•enterocytes
•macrophages
Peyer's patches
Mesenterial lymph nodes
Reticulo-endothelial system
Blood stream
Severe complications:
• toxic encephalopathy with myocarditis and haemodynamic shock
• necrosis of Peyer's patches with peritonitis and sepsis
Secondary infection:
•Bone-marrow
•Liver
•Spleen
•Gallbladder - chronic reservoir -
Re-infection via bile excretion

Explanation:

1. **Fimbriae-mediated adherence**: *Salmonella* species possess fimbriae (pili) that help them adhere to the intestinal epithelial cells.
2. **Type III secretion system (T3SS)**: *Salmonella* uses a Type III secretion system to inject effector proteins into host cells, leading to endocytosis (membrane ruffling and invasion of the epithelial cells).
3. **Transport to the lamina propria**: After invasion, *Salmonella* can cross the intestinal epithelium and enter the lamina propria, where it elicits a strong inflammatory response.
4. **Localized inflammatory response**: This inflammation, mediated by immune cells, contributes to the diarrhea and other clinical symptoms seen in *Salmonella* infections.

877. A 47-year-old woman in India is becoming blind due to repeated infection with Chlamydia trachomatis. What is seen in the pus draining from her eyes and stained by immunofluorescence?

(A) Elementary bodies
(B) Inclusion bodies
(C) Negri bodies
(D) Gram-negative diplococci
(E) Gram-positive diplococci

Key a

C. trachomatis exists in two main forms during its life cycle:

Elementary bodies (EBs): The infectious, extracellular form that can be seen in stained smears, including immunofluorescence staining.

Reticulate bodies (RBs): The non-infectious, intracellular replicative form.

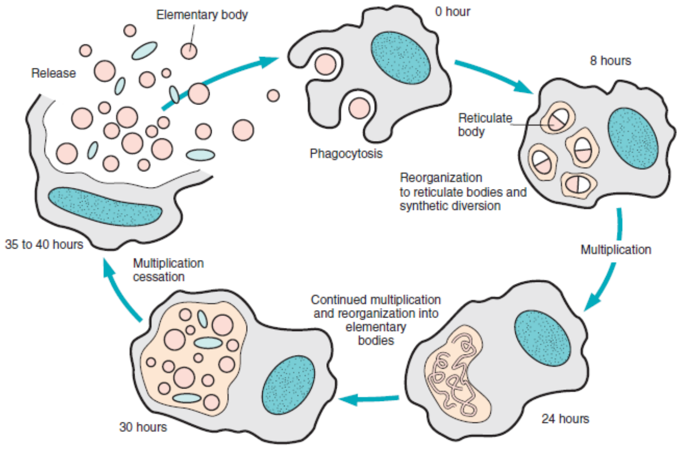
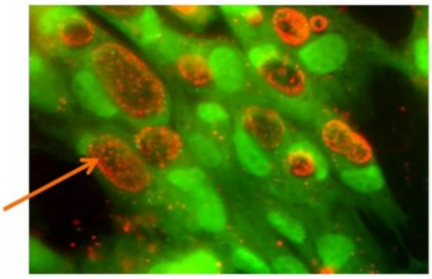

Elementary body
0 hour
Release
Phagocytosis
8 hours
Reticulate body
Reorganization to reticulate bodies and synthetic diversion
Multiplication
35 to 40 hours
Multiplication cessation
Continued multiplication and reorganization into elementary bodies
24 hours
30 hours

FIG. 24.1 Life cycle of *Chlamydia*.



Immunofluorescences (IF) stain

878. A new rapid diagnostic test for strep throat was undergoing clinical trials. Among 500 culture- positive individuals with sore throat, 500 were positive by the test. Among 500 culture-negative individuals without sore throat, 200were negative by the test. Describe the sensitivity and specificity of this test.

(A) High sensitivity; high specificity
(B) High sensitivity; low specificity
(C) Low sensitivity; high specificity
(D) Low sensitivity; low specificity

Key b

Sensitivity is the proportion of true positives (individuals with the disease who test positive) out of all those who actually have the disease

True positives (TP) = 500 (Culture-positive individuals who tested positive)

Total positives (people who actually have strep throat) = 500 (Culture-positive individuals)

Specificity is the proportion of true negatives (individuals without the disease who test negative) out of all those who actually do not have the disease.

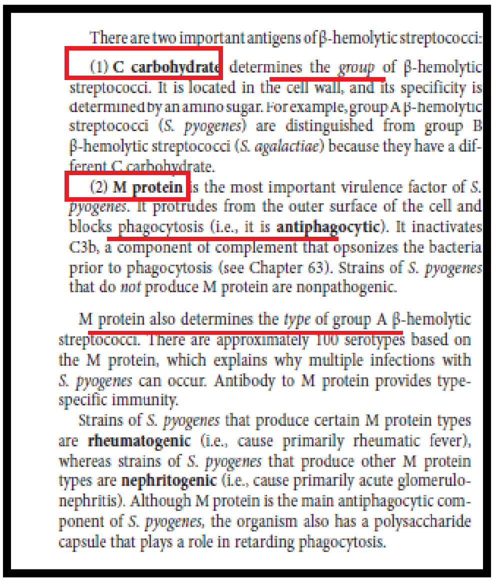
True negatives (TN) = 300 (Culture-negative individuals who tested negative)

Total negatives (people who don't have strep throat) = 500 (Culture-negative individuals)

879. An 8-year-old girl presents to the urgent care facility with 1 day history of fever, sore throat, malaise and headache. Physical examination reveals a temperature of 39 °C, cervical lymphadenopathy, and a whitish tonsillar exudate. A rapid diagnostic test is negative; however, culture of the exudates grew Gram-positive cocci in chains that caused beta-hemolysis on blood agar. What is the basis of serotyping of the pathogen?

a) Capsular antigens
b) Cell wall antigens
c) Flagellar antigens
d) O antigens
e) M antigens

Key e



There are two important antigens of β-hemolytic streptococci:

(1) **C carbohydrate** determines the *group* of β-hemolytic streptococci. It is located in the cell wall, and its specificity is determined by an amino sugar. For example, group A β-hemolytic streptococci (*S. pyogenes*) are distinguished from group B β-hemolytic streptococci (*S. agalactiae*) because they have a different C carbohydrate.

(2) **M protein** is the most important virulence factor of *S. pyogenes*. It protrudes from the outer surface of the cell and blocks phagocytosis (i.e., it is **antiphagocytic**). It inactivates C3b, a component of complement that opsonizes the bacteria prior to phagocytosis (see Chapter 63). Strains of *S. pyogenes* that do *not* produce M protein are nonpathogenic.

M protein also determines the *type* of group A β-hemolytic streptococci. There are approximately 100 serotypes based on the M protein, which explains why multiple infections with *S. pyogenes* can occur. Antibody to M protein provides type-specific immunity.

Strains of *S. pyogenes* that produce certain M protein types are **rheumatogenic** (i.e., cause primarily rheumatic fever), whereas strains of *S. pyogenes* that produce other M protein types are **nephritogenic** (i.e., cause primarily acute glomerulonephritis). Although M protein is the main antiphagocytic component of *S. pyogenes*, the organism also has a polysaccharide capsule that plays a role in retarding phagocytosis.

880. A 2 month old infant presents with violent coughing spells often ending with vomiting for past 2 days. The illness started with a mild flu like illness 2 weeks ago. Vaccination history is unknown. No retractions wheezing or stridor were noted on physical exam. Chest Xray was normal. Complete blood picture revealed WBC count of 20,000 with 70% lymphocytes. Which of the following disease is most likely?

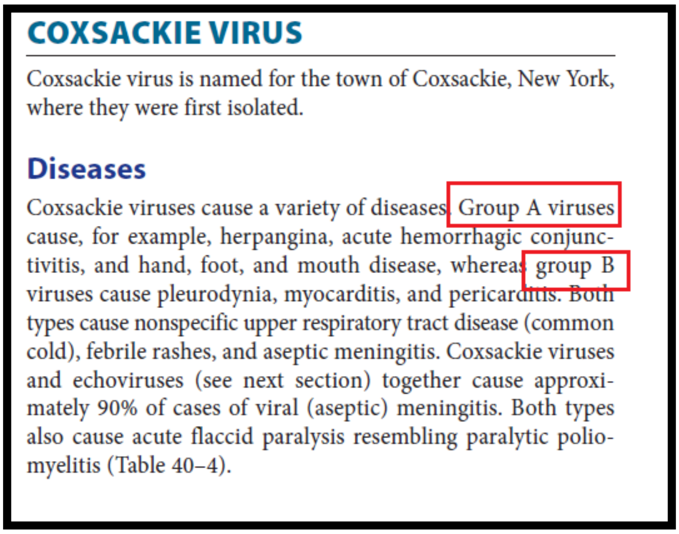
a. Bronchiolitis
b. CROUP
c. Epiglottitis
d. Pertussis
e. Pneumonia

Key d

881. A 25 year old woman developed fever, chest pain, arrhythmia 1 week after experiencing flu like illness. A variety of tests led to diagnosis of myocarditis of microbial origin. What is the most likely etiology?

A) Borrelia burgdorferi
B) Corynebacterium diphtheria
C) Coxsackie virus B
D) Influenza virus
E) Trypanosoma cruzei

Key c



COXSACKIE VIRUS

Coxsackie virus is named for the town of Coxsackie, New York, where they were first isolated.

Diseases

Coxsackie viruses cause a variety of diseases. Group A viruses cause, for example, herpangina, acute hemorrhagic conjunctivitis, and hand, foot, and mouth disease, whereas group B viruses cause pleurodynia, myocarditis, and pericarditis. Both types cause nonspecific upper respiratory tract disease (common cold), febrile rashes, and aseptic meningitis. Coxsackie viruses and echoviruses (see next section) together cause approximately 90% of cases of viral (aseptic) meningitis. Both types also cause acute flaccid paralysis resembling paralytic poliomyelitis (Table 40–4).

Coxsackievirus A and B are both types of enteroviruses, which are members of the Picornaviridae family.

Corynebacterium diphtheriae: **Diphtheria can cause myocarditis, but it usually presents with a characteristic pseudomembrane in the throat and respiratory distress, which was not mentioned in this case.**

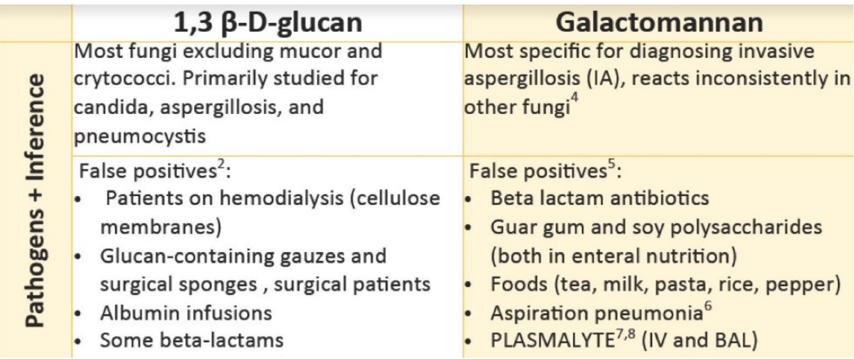
Influenza virus: **While influenza can cause myocarditis, it is less commonly the direct cause compared to Coxsackievirus B.**

Trypanosoma cruzi: **This parasite causes Chagas disease, which is more common in South America and typically causes chronic myocarditis rather than an acute presentation following a flu-like illness.**

882. A 45-year-old neutropenic cancer patient presents with fever, dyspnea, haemoptysis. Imaging studies reveal cavitatory lung lesions and are strongly suggestive of angioinvasive disease. Elevated galactomannan are found in serum and BAL . What is the etiology of this man's disease?

A) Aspergillus fumigatus
B) Candida glabrata
C) Klebsiella pneumoniae
D) Mycobacterium tuberculosis
E) Nocardia asteriodes

Key a



	1,3 β-D-glucan	Galactomannan
Pathogens + Inference	Most fungi excluding mucor and crytococci. Primarily studied for candida, aspergillosis, and pneumocystis	Most specific for diagnosing invasive aspergillosis (IA), reacts inconsistently in other fungi[4]
	False positives[2]: • Patients on hemodialysis (cellulose membranes) • Glucan-containing gauzes and surgical sponges , surgical patients • Albumin infusions • Some beta-lactams	False positives[5]: • Beta lactam antibiotics • Guar gum and soy polysaccharides (both in enteral nutrition) • Foods (tea, milk, pasta, rice, pepper) • Aspiration pneumonia[6] • PLASMALYTE[7,8] (IV and BAL)

883. A patient diagnosed with HIV infection is on anti-retroviral therapy. After several months of therapy he develops buffalo hump, central obesity and dyslipidemia. Which of the following drugs could account for these findings

A) Abacavir/lamivudine
B) Atazanavir and ritonavir
C) Efavirenz
D) Lamivudine alone

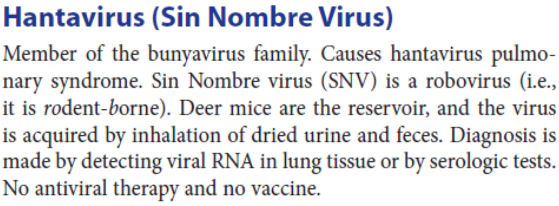
Key b

Atazanavir and ritonavir are protease inhibitors (PIs), which are known to be associated with lipodystrophy (a syndrome that includes fat redistribution such as buffalo hump and central obesity) and dyslipidemia

884. A previously healthy 35 year old male develops an acute onset of fever, chills, myalgias and headache. Which rapidly progressed to severe respiratory illness. He was hospitalized in ICU but despite of extensive supportive treatment, dies of acute respiratory distress. He was diagnosed postmortem with Hanta virus pulmonary syndrome. How might he had acquired this infection?

A) Cleaning out a rodent infested ware house
B) Exploring caves inhabited by bats
C) Exposure to mosquitoes
D) Hiking in tick infested woods
E) Swimming in a puddle

Key a



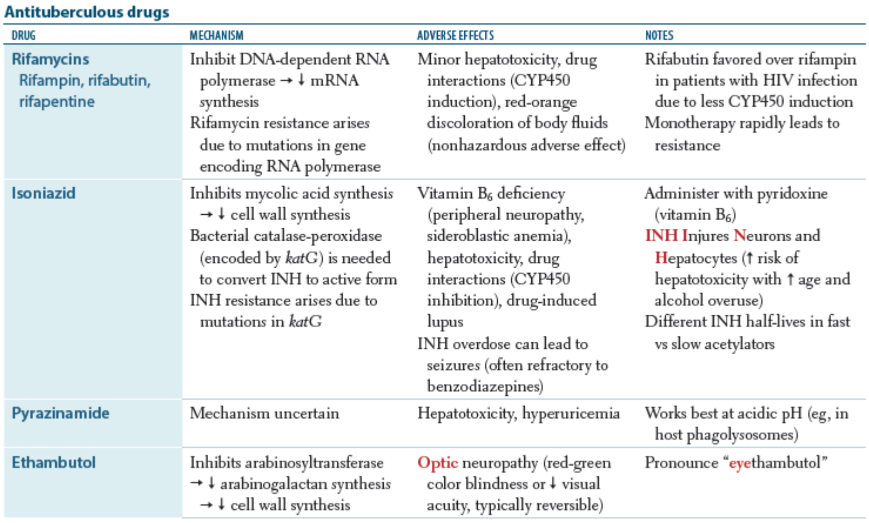
Hantavirus (Sin Nombre Virus)

Member of the bunyavirus family. Causes hantavirus pulmonary syndrome. Sin Nombre virus (SNV) is a robovirus (i.e., it is *ro*dent-*bo*rne). Deer mice are the reservoir, and the virus is acquired by inhalation of dried urine and feces. Diagnosis is made by detecting viral RNA in lung tissue or by serologic tests. No antiviral therapy and no vaccine.

885. A 48 year old man being treated with pulmonary tuberculosis presents with severe pain in right big toe for 1 day. Acute gouty arthritis is suspected and upon testing his serum uric acid levels are high. Which antituberculous agent had precipitated his symptoms?

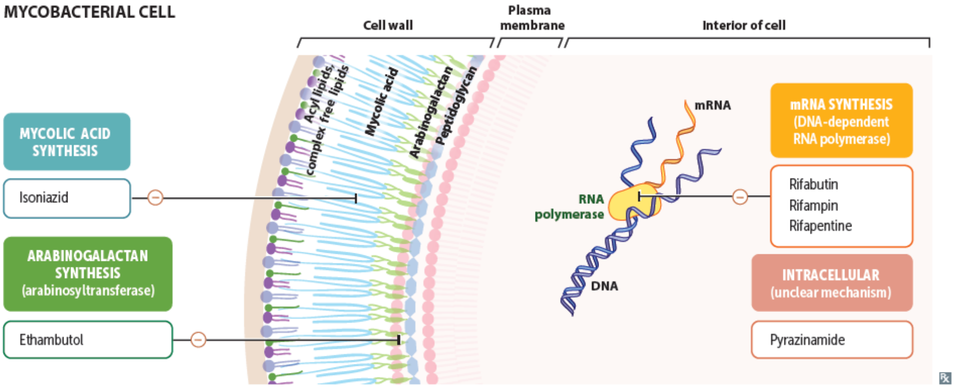
A) Ethambutol
B) Isoniazid
C) Pyrazinamide
D) Rifampin
E) Streptomycin

Key c



Antituberculous drugs

DRUG	MECHANISM	ADVERSE EFFECTS	NOTES
Rifamycins Rifampin, rifabutin, rifapentine	Inhibit DNA-dependent RNA polymerase → ↓ mRNA synthesis Rifamycin resistance arises due to mutations in gene encoding RNA polymerase	Minor hepatotoxicity, drug interactions (CYP450 induction), red-orange discoloration of body fluids (nonhazardous adverse effect)	Rifabutin favored over rifampin in patients with HIV infection due to less CYP450 induction Monotherapy rapidly leads to resistance
Isoniazid	Inhibits mycolic acid synthesis → ↓ cell wall synthesis Bacterial catalase-peroxidase (encoded by *katG*) is needed to convert INH to active form INH resistance arises due to mutations in *katG*	Vitamin B_6 deficiency (peripheral neuropathy, sideroblastic anemia), hepatotoxicity, drug interactions (CYP450 inhibition), drug-induced lupus INH overdose can lead to seizures (often refractory to benzodiazepines)	Administer with pyridoxine (vitamin B_6) INH Injures Neurons and Hepatocytes (↑ risk of hepatotoxicity with ↑ age and alcohol overuse) Different INH half-lives in fast vs slow acetylators
Pyrazinamide	Mechanism uncertain	Hepatotoxicity, hyperuricemia	Works best at acidic pH (eg, in host phagolysosomes)
Ethambutol	Inhibits arabinosyltransferase → ↓ arabinogalactan synthesis → ↓ cell wall synthesis	Optic neuropathy (red-green color blindness or ↓ visual acuity, typically reversible)	Pronounce "eyethambutol"


MYCOBACTERIAL CELL
Cell wall
Plasma membrane
Interior of cell
Acyl lipids, complex free lipids
Mycolic acid
Arabinogalactan
Peptidoglycan
MYCOLIC ACID SYNTHESIS
Isoniazid
ARABINOGALACTAN SYNTHESIS (arabinosyltransferase)
Ethambutol
mRNA
RNA polymerase
DNA
mRNA SYNTHESIS (DNA-dependent RNA polymerase)
Rifabutin
Rifampin
Rifapentine
INTRACELLULAR (unclear mechanism)
Pyrazinamide

The mechanism of action of PZA is uncertain, but there is evidence that it acts by inhibiting a fatty acid synthetase that prevents the synthesis of mycolic acid. (Levinson)

886. A 33 year old pregnant woman in her third trimester presents with mucopurulent vaginal discharge. A direct immunofluorescent stain on discharge shows elementary bodies. With which organism is she infected

A) Chlamydia trachomatis
B) HSV
C) Neisseria gonorrhea
D) Treponema pallidum
E) Trichomonas vaginalis

Key a

887. Which one of the following is a function of humoral (antibody-mediated) immunity?

A) Neutralize bacterial toxins
B) Activate the alternative pathway of complement
C) Inhibit the growth of Mycobacterium tuberculosis
D) Inhibit the growth of virus-infected cells by enhancing the production of perforins

Key a

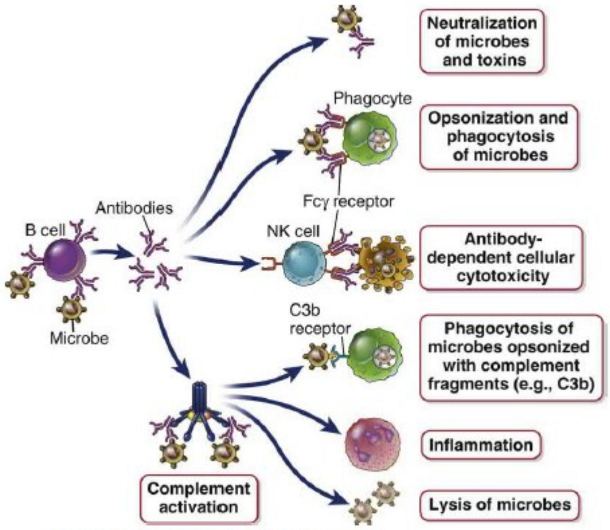
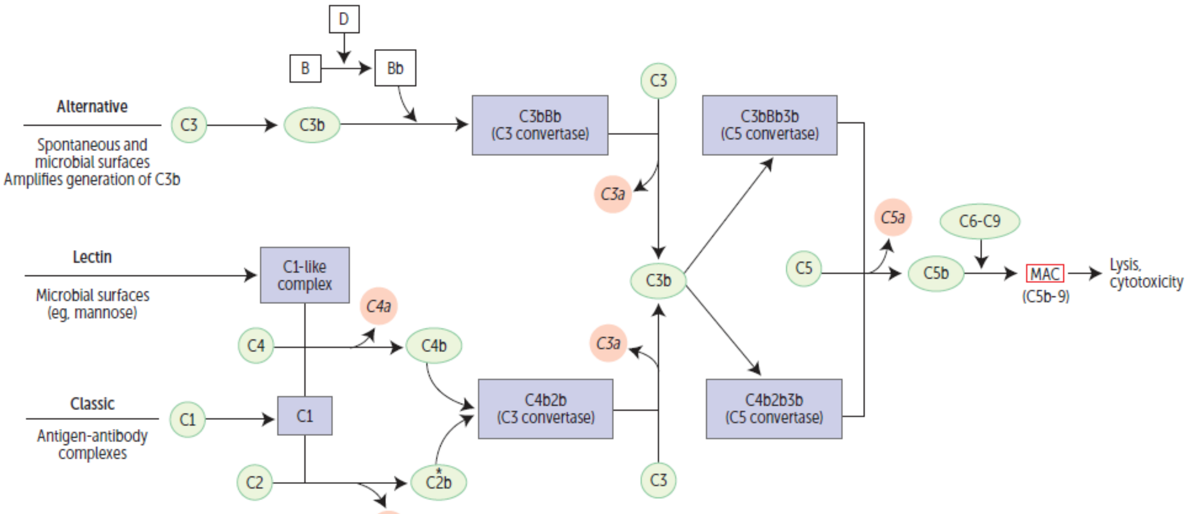

Neutralization of microbes and toxins
Phagocyte
Opsonization and phagocytosis of microbes
Fcγ receptor
Antibodies
B cell
NK cell
Antibody-dependent cellular cytotoxicity
Microbe
C3b receptor
Phagocytosis of microbes opsonized with complement fragments (e.g., C3b)
Inflammation
Complement activation
Lysis of microbes

FIGURE 13.1 Effector functions of antibodies. Antibodies against microbes (and their toxins, not shown) neutralize these agents, opsonize them for phagocytosis, sensitize them for antibody-dependent cellular cytotoxicity, and activate the complement system. These various effector functions may be mediated by different antibody isotypes. *NK*, Natural killer.


D
B
Bb
Alternative
Spontaneous and microbial surfaces
Amplifies generation of C3b
C3
C3b
C3bBb
(C3 convertase)
C3
C3a
C3bBb3b
(C5 convertase)
C5a
C6-C9
Lectin
Microbial surfaces
(eg, mannose)
C1-like complex
C4a
C3b
C5
C5b
MAC
(C5b-9)
Lysis, cytotoxicity
C4
C4b
C3a
Classic
Antigen-antibody complexes
C1
C1
C4b2b
(C3 convertase)
C4b2b3b
(C5 convertase)
C2
C2b*
C3
C2a*

*Historically, the larger fragment of C2 was called C2a but is now called C2b.

888. Latency is an outcome particularly characteristic of which one of the following virus groups?

A) Poliovirus
B) Herpesvirus
C) Rhinovirus
D) Influenza virus

Key b

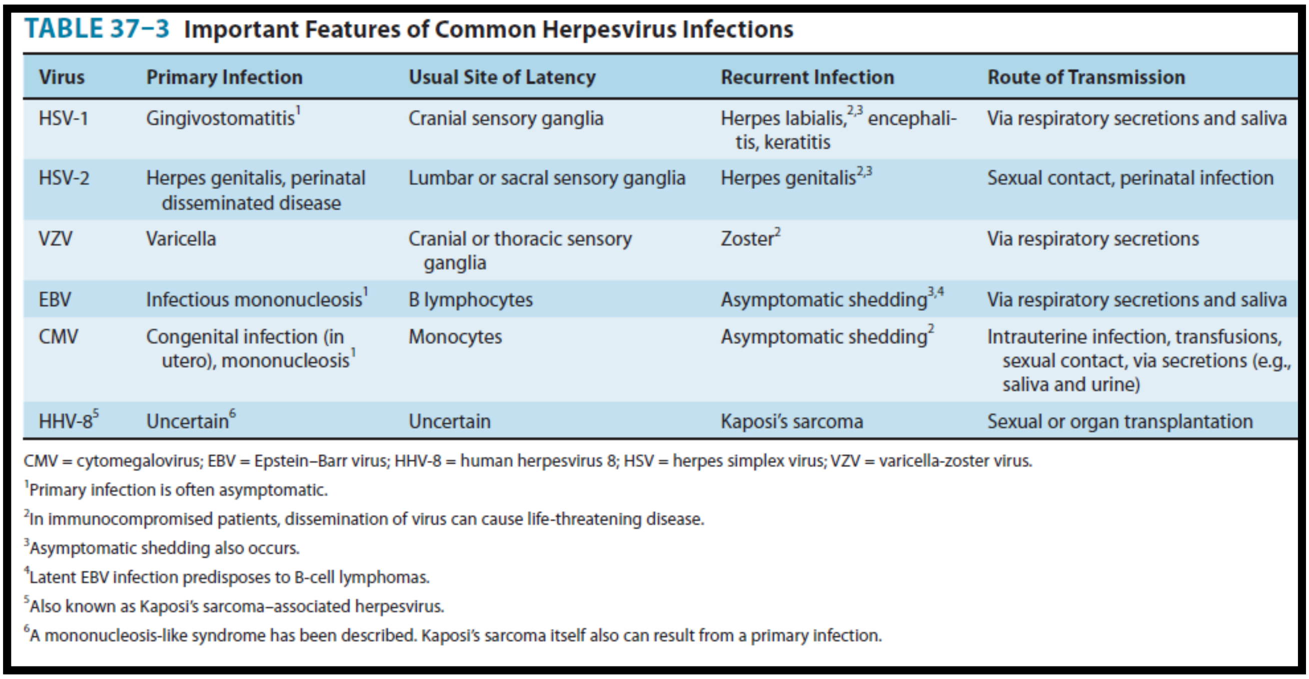


TABLE 37–3 Important Features of Common Herpesvirus Infections

Virus	Primary Infection	Usual Site of Latency	Recurrent Infection	Route of Transmission
HSV-1	Gingivostomatitis[1]	Cranial sensory ganglia	Herpes labialis,[2,3] encephalitis, keratitis	Via respiratory secretions and saliva
HSV-2	Herpes genitalis, perinatal disseminated disease	Lumbar or sacral sensory ganglia	Herpes genitalis[2,3]	Sexual contact, perinatal infection
VZV	Varicella	Cranial or thoracic sensory ganglia	Zoster[2]	Via respiratory secretions
EBV	Infectious mononucleosis[1]	B lymphocytes	Asymptomatic shedding[3,4]	Via respiratory secretions and saliva
CMV	Congenital infection (in utero), mononucleosis[1]	Monocytes	Asymptomatic shedding[2]	Intrauterine infection, transfusions, sexual contact, via secretions (e.g., saliva and urine)
HHV-8[5]	Uncertain[6]	Uncertain	Kaposi's sarcoma	Sexual or organ transplantation

CMV = cytomegalovirus; EBV = Epstein–Barr virus; HHV-8 = human herpesvirus 8; HSV = herpes simplex virus; VZV = varicella-zoster virus.

[1] Primary infection is often asymptomatic.

[2] In immunocompromised patients, dissemination of virus can cause life-threatening disease.

[3] Asymptomatic shedding also occurs.

[4] Latent EBV infection predisposes to B-cell lymphomas.

[5] Also known as Kaposi's sarcoma–associated herpesvirus.

[6] A mononucleosis-like syndrome has been described. Kaposi's sarcoma itself also can result from a primary infection.

889. You have made a clinical diagnosis of meningitis in a 50-year-old immunocompromised woman. A latex agglutination test on the spinal fluid for capsular polysaccharide antigen is positive. Of the following organisms, which one is the most likely cause?

A) Histoplasma capsulatum
B) Cryptococcus neoformans
C) Aspergillus fumigatus
D) Candida albicans

Key b

890. The pathogenesis of which disease does NOT involve an exotoxin

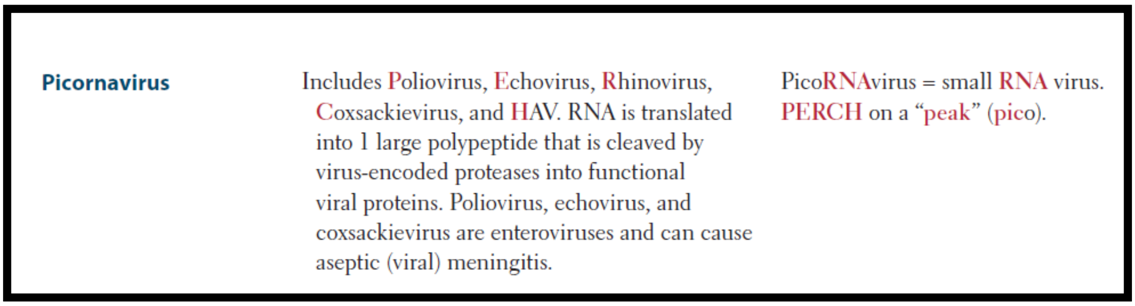
a. Scarlet fever
b. Typhoid fever
c. Toxic shock syndrome
d. Botulism

Key b

891. Each of the following clinical syndromes is associated with infection by picorna virus EXCEPT

a. Myocarditis
b. Hepatitis
c. Mononucleosis
d. Meningitis

Key c

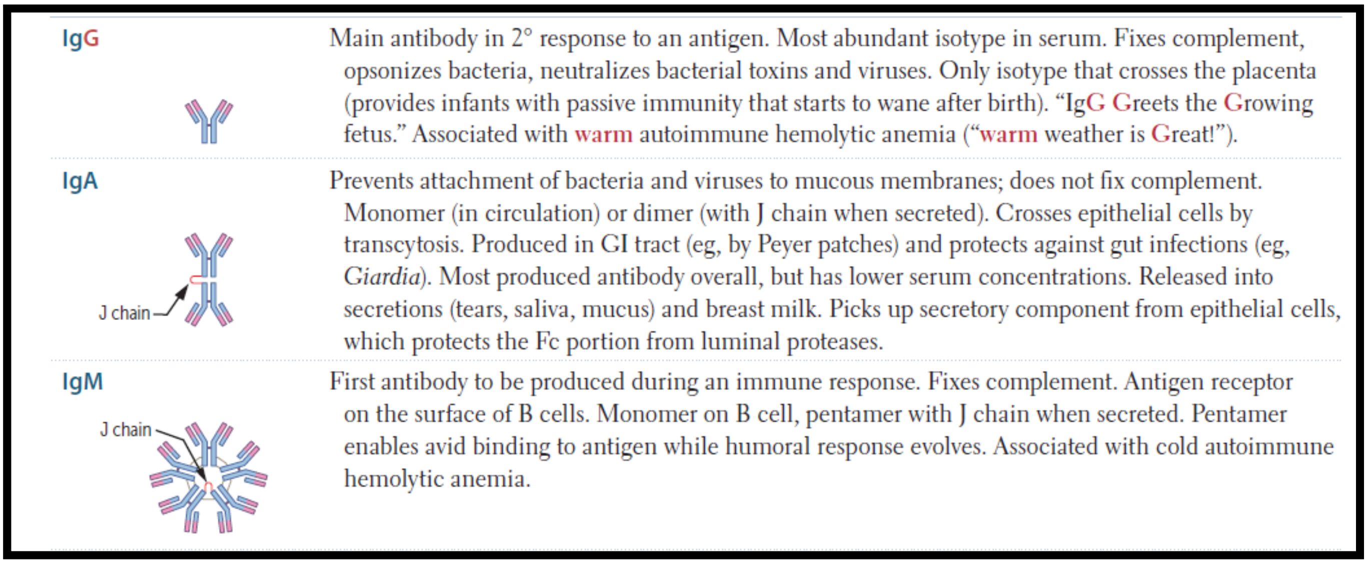


Picornavirus	Includes Poliovirus, Echovirus, Rhinovirus, Coxsackievirus, and HAV. RNA is translated into 1 large polypeptide that is cleaved by virus-encoded proteases into functional viral proteins. Poliovirus, echovirus, and coxsackievirus are enteroviruses and can cause aseptic (viral) meningitis.	PicoRNAvirus = small RNA virus. PERCH on a "peak" (pico).

892. An individual is genetically unable to make J chains which immunoglobulin would be affected

a. Ig D
b. Ig G
c. Ig A
d. Ig G and Ig M
e. Ig M and ig A

Key e



IgG	Main antibody in 2° response to an antigen. Most abundant isotype in serum. Fixes complement, opsonizes bacteria, neutralizes bacterial toxins and viruses. Only isotype that crosses the placenta (provides infants with passive immunity that starts to wane after birth). "IgG Greets the Growing fetus." Associated with warm autoimmune hemolytic anemia ("warm weather is Great!").
IgA	Prevents attachment of bacteria and viruses to mucous membranes; does not fix complement. Monomer (in circulation) or dimer (with J chain when secreted). Crosses epithelial cells by transcytosis. Produced in GI tract (eg, by Peyer patches) and protects against gut infections (eg, *Giardia*). Most produced antibody overall, but has lower serum concentrations. Released into secretions (tears, saliva, mucus) and breast milk. Picks up secretory component from epithelial cells, which protects the Fc portion from luminal proteases.
IgM	First antibody to be produced during an immune response. Fixes complement. Antigen receptor on the surface of B cells. Monomer on B cell, pentamer with J chain when secreted. Pentamer enables avid binding to antigen while humoral response evolves. Associated with cold autoimmune hemolytic anemia.

893. Ticks are vectors of transmission for all EXCEPT

a. Rocky Mountain spotted fever
b. Epidemic typhus
c. Tularemia
d. Lyme disease

Key b

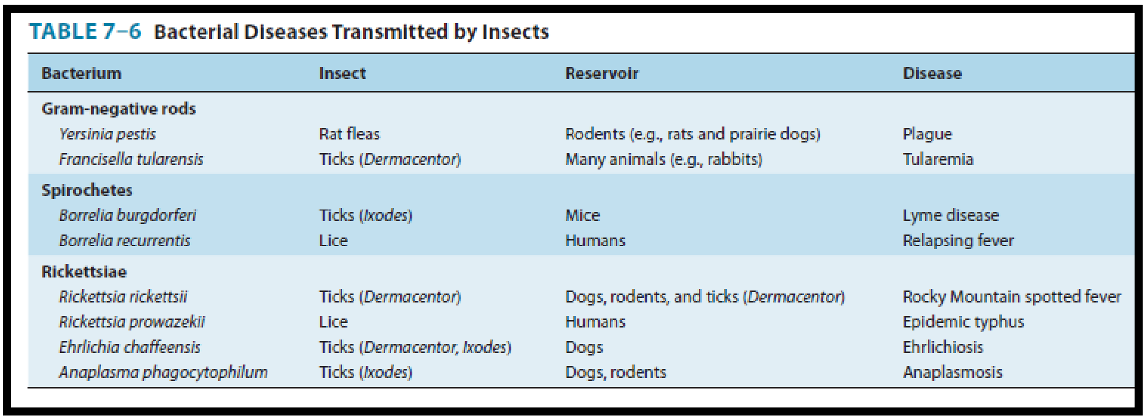


TABLE 7–6 **Bacterial Diseases Transmitted by Insects**

Bacterium	Insect	Reservoir	Disease
Gram-negative rods			
Yersinia pestis	Rat fleas	Rodents (e.g., rats and prairie dogs)	Plague
Francisella tularensis	Ticks (*Dermacentor*)	Many animals (e.g., rabbits)	Tularemia
Spirochetes			
Borrelia burgdorferi	Ticks (*Ixodes*)	Mice	Lyme disease
Borrelia recurrentis	Lice	Humans	Relapsing fever
Rickettsiae			
Rickettsia rickettsii	Ticks (*Dermacentor*)	Dogs, rodents, and ticks (*Dermacentor*)	Rocky Mountain spotted fever
Rickettsia prowazekii	Lice	Humans	Epidemic typhus
Ehrlichia chaffeensis	Ticks (*Dermacentor, Ixodes*)	Dogs	Ehrlichiosis
Anaplasma phagocytophilum	Ticks (*Ixodes*)	Dogs, rodents	Anaplasmosis

894. Diarrhea caused by which of the following agents is characterized by presence of fecal leukocytes

a. Campylobacter jejuni
b. Rota virus
c. Clostridium perfringens
d. Enterotoxigenic E. coli

Key a

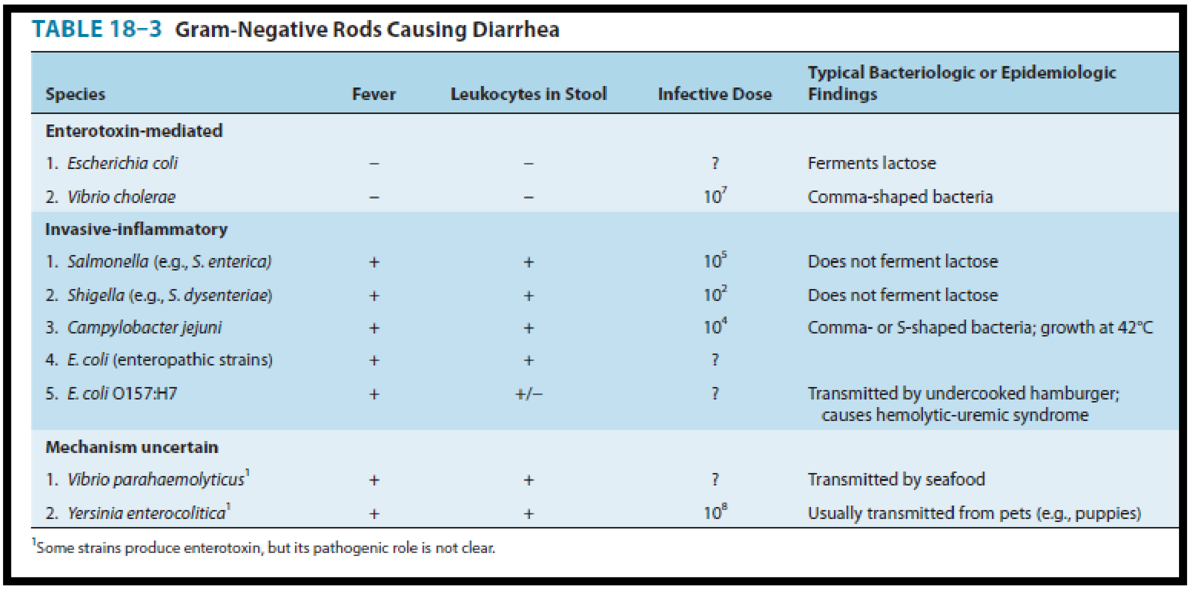


TABLE 18–3 Gram-Negative Rods Causing Diarrhea

Species	Fever	Leukocytes in Stool	Infective Dose	Typical Bacteriologic or Epidemiologic Findings
Enterotoxin-mediated				
1. *Escherichia coli*	–	–	?	Ferments lactose
2. *Vibrio cholerae*	–	–	10^7	Comma-shaped bacteria
Invasive-inflammatory				
1. *Salmonella* (e.g., *S. enterica*)	+	+	10^5	Does not ferment lactose
2. *Shigella* (e.g., *S. dysenteriae*)	+	+	10^2	Does not ferment lactose
3. *Campylobacter jejuni*	+	+	10^4	Comma- or S-shaped bacteria; growth at 42°C
4. *E. coli* (enteropathic strains)	+	+	?	
5. *E. coli* O157:H7	+	+/–	?	Transmitted by undercooked hamburger; causes hemolytic-uremic syndrome
Mechanism uncertain				
1. *Vibrio parahaemolyticus*[1]	+	+	?	Transmitted by seafood
2. *Yersinia enterocolitica*[1]	+	+	10^8	Usually transmitted from pets (e.g., puppies)

[1] Some strains produce enterotoxin, but its pathogenic role is not clear.

895. Most common cause of lower respiratory tract infection in infants

a. Respiratory syncytial virus
b. Adeno virus
c. Rhinovirus
d. Coxsackie virus

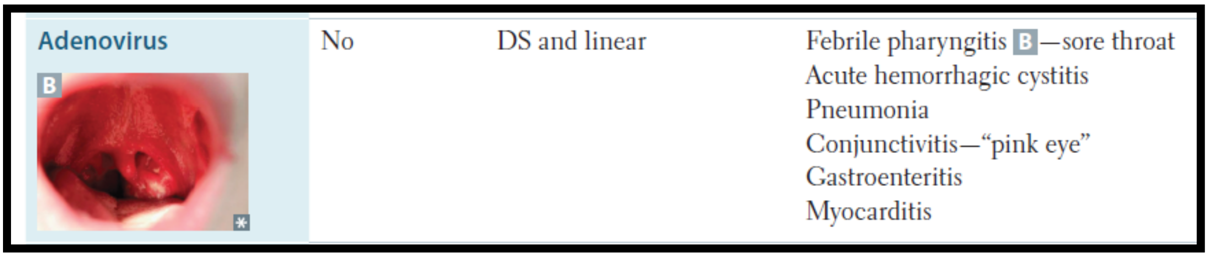
Key a

Adenovirus:
Adenovirus can cause respiratory infections BUT is not the most common cause of LRTIs in infants. It is associated with pharyngitis, conjunctivitis, and pneumonia.
Rhinovirus:
Rhinovirus is the most common cause of the common cold and primarily affects the UPPER respiratory tract.
Coxsackie virus:
Coxsackie viruses (Picornavirus family) can cause herpangina, hand-foot-mouth disease, and myocarditis. They are not a common cause of LRTIs.

896. Which of the following is least likely to be caused by adeno virus

a. Conjunctivitis
b. Pneumonia
c. Pharyngitis
d. Glomerulonephritis

Key d

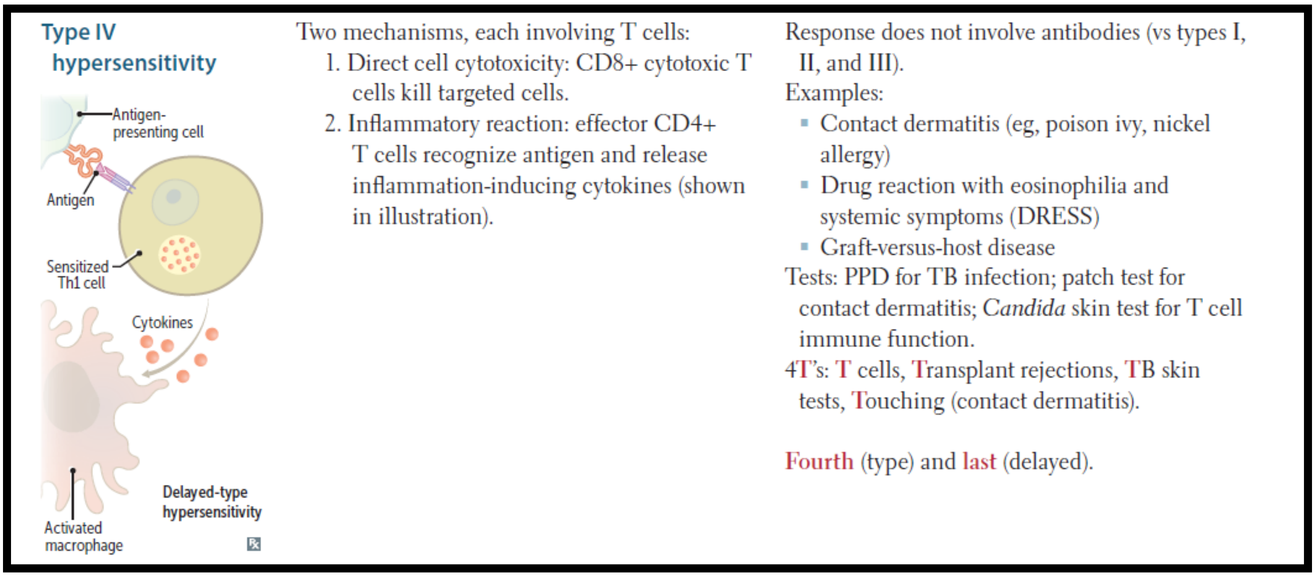


Adenovirus B	No	DS and linear	Febrile pharyngitis B—sore throat Acute hemorrhagic cystitis Pneumonia Conjunctivitis—“pink eye” Gastroenteritis Myocarditis

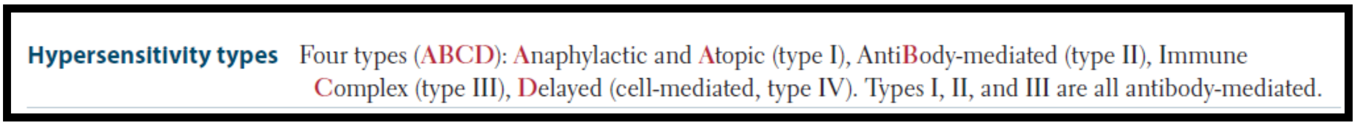
897. Which one of the following diseases is MOST likely to be caused by a delayed hypersensitivity reaction?

(A) Serum sickness
(B) Post streptococcal glomerulonephritis
(C) Systemic lupus erythematosus
(D) Haemolytic disease of the new born
(E) Contact dermatitis

Key e


Antigen-presenting cell
Antigen
Sensitized Th1 cell
Cytokines
Activated macrophage
Delayed-type hypersensitivity

Type IV hypersensitivity	Two mechanisms, each involving T cells: 1. Direct cell cytotoxicity: CD8+ cytotoxic T cells kill targeted cells. 2. Inflammatory reaction: effector CD4+ T cells recognize antigen and release inflammation-inducing cytokines (shown in illustration).	Response does not involve antibodies (vs types I, II, and III). Examples: ▪ Contact dermatitis (eg, poison ivy, nickel allergy) ▪ Drug reaction with eosinophilia and systemic symptoms (DRESS) ▪ Graft-versus-host disease Tests: PPD for TB infection; patch test for contact dermatitis; *Candida* skin test for T cell immune function. 4T's: T cells, Transplant rejections, TB skin tests, Touching (contact dermatitis). Fourth (type) and last (delayed).



Hypersensitivity types	Four types (ABCD): Anaphylactic and Atopic (type I), AntiBody-mediated (type II), Immune Complex (type III), Delayed (cell-mediated, type IV). Types I, II, and III are all antibody-mediated.

898. Your patient is a 20-year-old man with a urethral discharge. Gram stain of the pus reveals many neutrophils but no bacteria. Which one of the following organisms is the MOST likely cause?

(A) Treponema pallidum
(B) Haemophilus ducreyi
(C) Mycobacterium marinum
(D) Candida albicans
(E) Chlamydia trachomatis

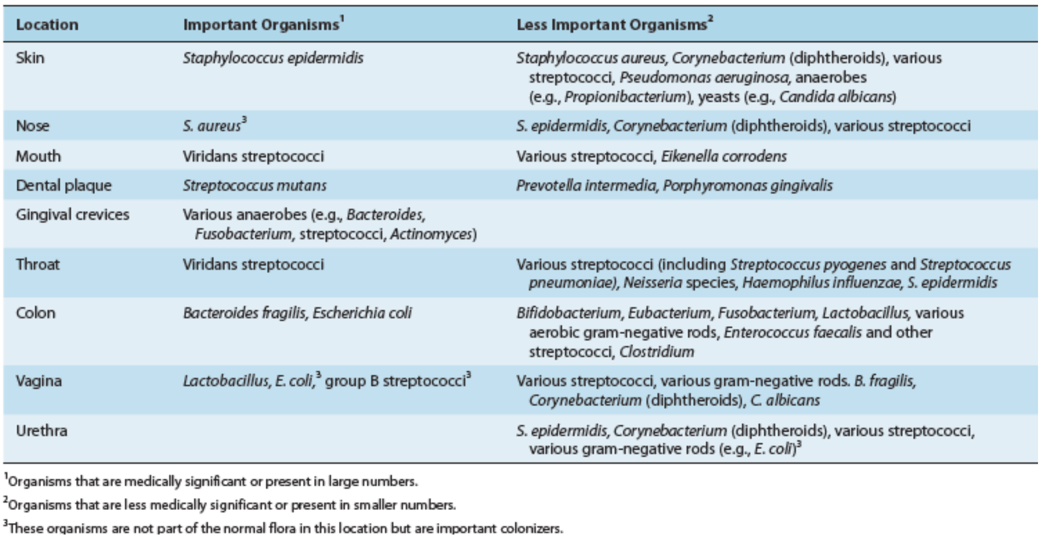
Key e

899. A 36-year-old man presents with focal nervous system signs. Imaging shows a brain abscess. The dominant organism is an anaerobe normally found as a part of normal flora. Which of the following best fits the description.?

A) Nocardia
B) Actinomyces
C) Mycobacterium
D) Pseudomonas aeruginosa

Answer : B Actinomyces

TABLE 6–2 Medically Important Members of the Normal Flora



Location	Important Organisms[1]	Less Important Organisms[2]
Skin	*Staphylococcus epidermidis*	*Staphylococcus aureus, Corynebacterium* (diphtheroids), various streptococci, *Pseudomonas aeruginosa,* anaerobes (e.g., *Propionibacterium*), yeasts (e.g., *Candida albicans*)
Nose	*S. aureus*[3]	*S. epidermidis, Corynebacterium* (diphtheroids), various streptococci
Mouth	Viridans streptococci	Various streptococci, *Eikenella corrodens*
Dental plaque	*Streptococcus mutans*	*Prevotella intermedia, Porphyromonas gingivalis*
Gingival crevices	Various anaerobes (e.g., *Bacteroides, Fusobacterium,* streptococci, *Actinomyces*)	
Throat	Viridans streptococci	Various streptococci (including *Streptococcus pyogenes* and *Streptococcus pneumoniae), Neisseria* species, *Haemophilus influenzae, S. epidermidis*
Colon	*Bacteroides fragilis, Escherichia coli*	*Bifidobacterium, Eubacterium, Fusobacterium, Lactobacillus,* various aerobic gram-negative rods, *Enterococcus faecalis* and other streptococci, *Clostridium*
Vagina	*Lactobacillus, E. coli,*[3] group B streptococci[3]	Various streptococci, various gram-negative rods. *B. fragilis, Corynebacterium* (diphtheroids), *C. albicans*
Urethra		*S. epidermidis, Corynebacterium* (diphtheroids), various streptococci, various gram-negative rods (e.g., *E. coli*)[3]

[1] Organisms that are medically significant or present in large numbers.

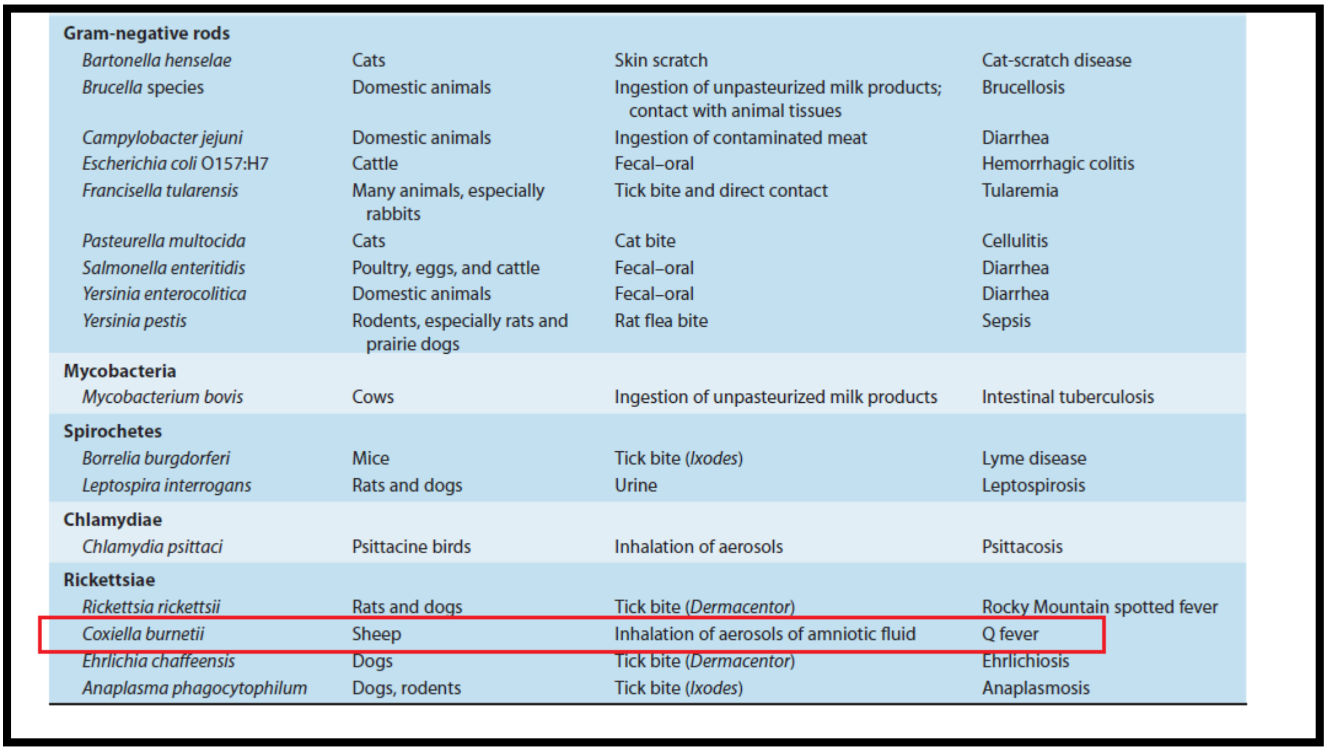
[2] Organisms that are less medically significant or present in smaller numbers.

[3] These organisms are not part of the normal flora in this location but are important colonizers.

900. A 23 year old man recently started working in a sheep farm. He develops pneumonia shortly after helping with lambing. His cough produces little sputum and a saline induced sputum shows no predominant organism both by gram stain and Acid fast stain. It is established that he acquired pneumonia from parturition products of sheep. Which agent is most likely to be cause of his pneumonia?

A) Rickettsia akari
B) Rickettsia typhi
C) Coxiella burnetti
D) Anaplasma phagocytophilum

Answer: c Coxiella burnetti

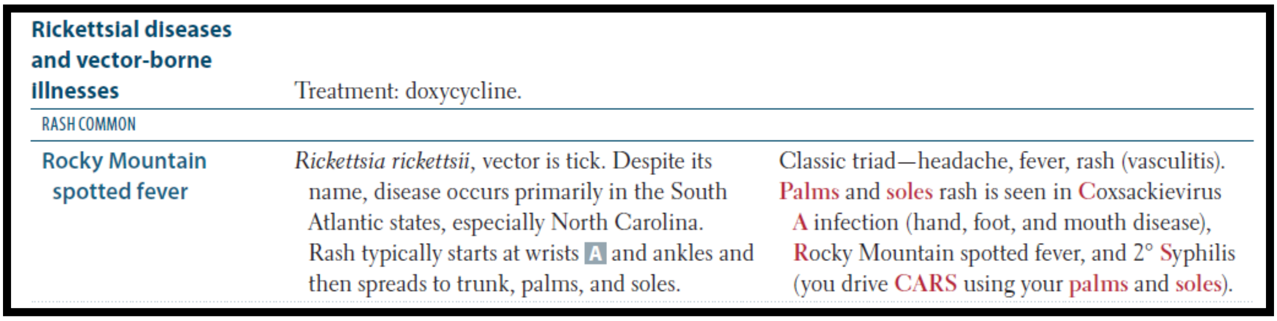


Gram-negative rods			
Bartonella henselae	Cats	Skin scratch	Cat-scratch disease
Brucella species	Domestic animals	Ingestion of unpasteurized milk products; contact with animal tissues	Brucellosis
Campylobacter jejuni	Domestic animals	Ingestion of contaminated meat	Diarrhea
Escherichia coli O157:H7	Cattle	Fecal–oral	Hemorrhagic colitis
Francisella tularensis	Many animals, especially rabbits	Tick bite and direct contact	Tularemia
Pasteurella multocida	Cats	Cat bite	Cellulitis
Salmonella enteritidis	Poultry, eggs, and cattle	Fecal–oral	Diarrhea
Yersinia enterocolitica	Domestic animals	Fecal–oral	Diarrhea
Yersinia pestis	Rodents, especially rats and prairie dogs	Rat flea bite	Sepsis
Mycobacteria			
Mycobacterium bovis	Cows	Ingestion of unpasteurized milk products	Intestinal tuberculosis
Spirochetes			
Borrelia burgdorferi	Mice	Tick bite (*Ixodes*)	Lyme disease
Leptospira interrogans	Rats and dogs	Urine	Leptospirosis
Chlamydiae			
Chlamydia psittaci	Psittacine birds	Inhalation of aerosols	Psittacosis
Rickettsiae			
Rickettsia rickettsii	Rats and dogs	Tick bite (*Dermacentor*)	Rocky Mountain spotted fever
Coxiella burnetii	Sheep	Inhalation of aerosols of amniotic fluid	Q fever
Ehrlichia chaffeensis	Dogs	Tick bite (*Dermacentor*)	Ehrlichiosis
Anaplasma phagocytophilum	Dogs, rodents	Tick bite (*Ixodes*)	Anaplasmosis

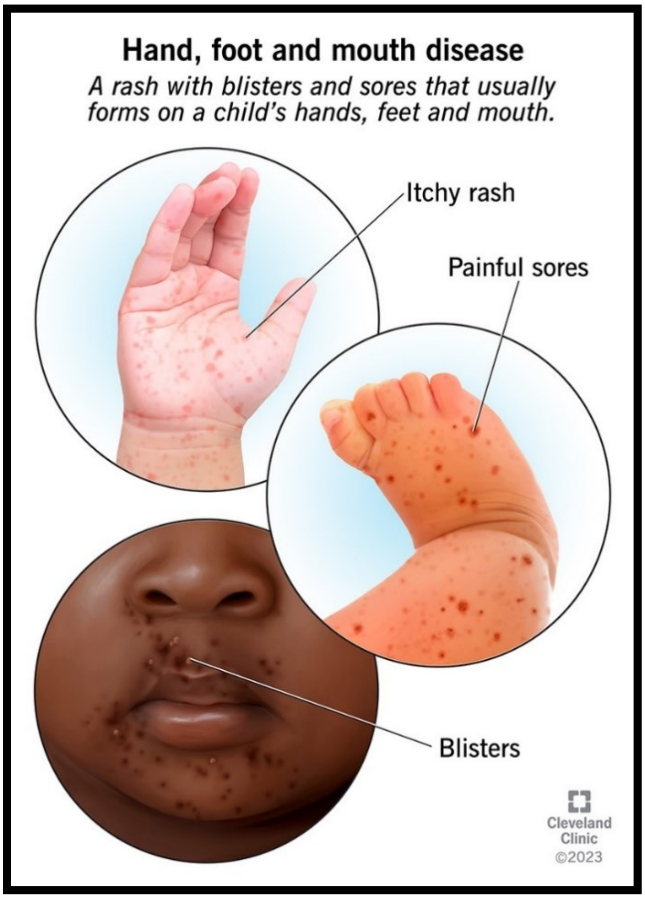
901. An 8 year old boy had fever and sore throat. He had ulcerative lesions in his mouth, vesicular lesions on his hand and foot. The most probable cause of his disease is

A) Coxsackie Virus
B) Human Herpes virus 6
C) HSV
D) HPV

Answer: a Coxsackie Virus



Rickettsial diseases and vector-borne illnesses	Treatment: doxycycline.	
RASH COMMON		
Rocky Mountain spotted fever	*Rickettsia rickettsii*, vector is tick. Despite its name, disease occurs primarily in the South Atlantic states, especially North Carolina. Rash typically starts at wrists A and ankles and then spreads to trunk, palms, and soles.	Classic triad—headache, fever, rash (vasculitis). Palms and soles rash is seen in Coxsackievirus A infection (hand, foot, and mouth disease), Rocky Mountain spotted fever, and 2° Syphilis (you drive CARS using your palms and soles).


Hand, foot and mouth disease
A rash with blisters and sores that usually forms on a child's hands, feet and mouth.
Itchy rash
Painful sores
Blisters
Cleveland Clinic
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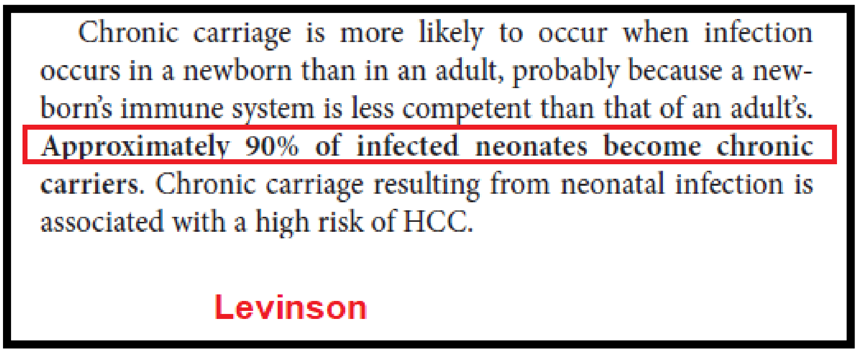
902. The individual most likely to develop chronic liver disease is

A) 1 month old infant infected with HBV
B) 22 year old coinfected with HBV and HDV
C) A 26 year old alcoholic and intravenous drug abuser infected with HBV
D) 30 year old infected with yellow fever virus

Answer: a 1 month old infant infected with HBV



Chronic carriage is more likely to occur when infection occurs in a newborn than in an adult, probably because a newborn's immune system is less competent than that of an adult's. **Approximately 90% of infected neonates become chronic** carriers. Chronic carriage resulting from neonatal infection is associated with a high risk of HCC.

Levinson

903. A premature infant on parenteral high lipid fluids has developed septicemia that cultures out on blood agar only when laid with sterile olive oil. What is the most likely causative agent?

A) Aspergillus
B) Candida
C) Cryptococcus
D) Malassezia furfur

Answer: Malassezia furfur

The key clues in this case are:

- **Premature infant on parenteral high-lipid fluids (such as lipid emulsions for nutrition).**
- **Septicemia with blood cultures that grow only when overlaid with sterile olive oil.**

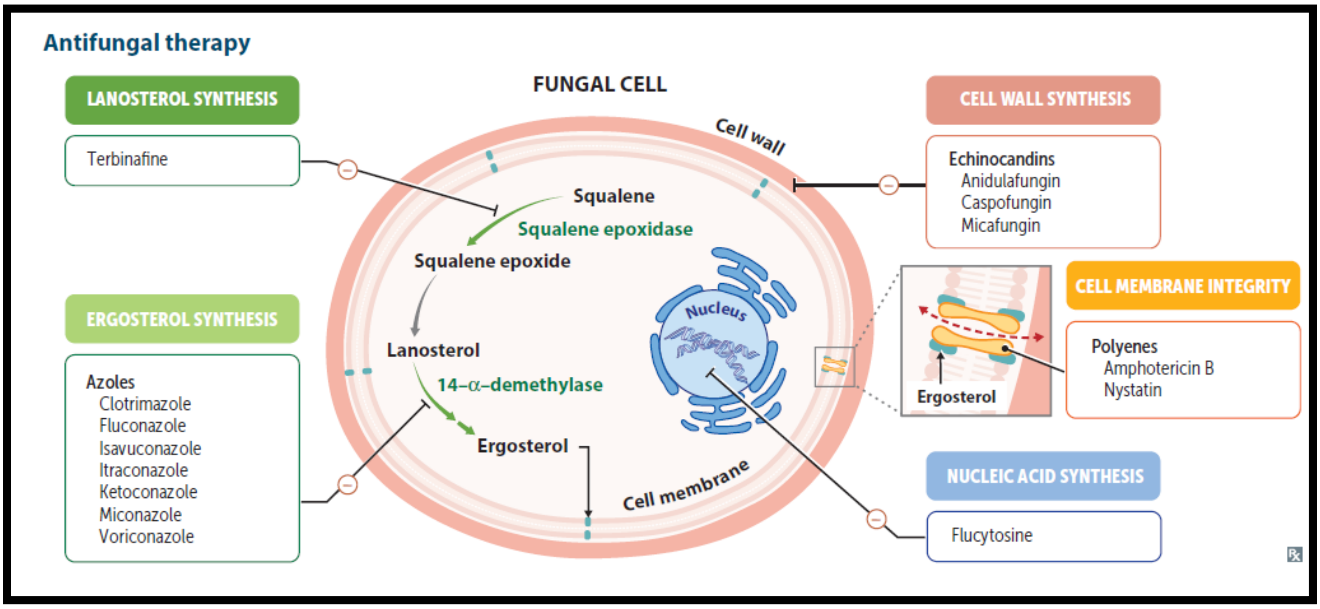
(Total Parenteral Nutrition (TPN) is a key clue because it provides lipid-rich fluids, which are a major source of

nutrition for patients, especially premature infants who may have difficulty feeding orally.)
These findings point to Malassezia furfur, a lipophilic yeast.

904. Which of the following is a polyene antifungal agent used for treatment of life threatening infections?

a) Amphotericin B
b) Grisofulvin
c) Itraconazole
d) Miconazole

Answer:a Amphotericin B


Antifungal therapy
LANOSTEROL SYNTHESIS
Terbinafine
ERGOSTEROL SYNTHESIS
Azoles
Clotrimazole
Fluconazole
Isavuconazole
Itraconazole
Ketoconazole
Miconazole
Voriconazole
FUNGAL CELL
Cell wall
Squalene
Squalene epoxidase
Squalene epoxide
Lanosterol
14–α–demethylase
Ergosterol
Nucleus
Cell membrane
CELL WALL SYNTHESIS
Echinocandins
Anidulafungin
Caspofungin
Micafungin
CELL MEMBRANE INTEGRITY
Ergosterol
Polyenes
Amphotericin B
Nystatin
NUCLEIC ACID SYNTHESIS
Flucytosine

905. Which of the following features differentiates fungal cells from human cells

A) 80s Ribosomes
B) Presence of Endoplasmic Reticulum
C) Ergosterol as major membrane sterol
D) Presence of chloroplasts

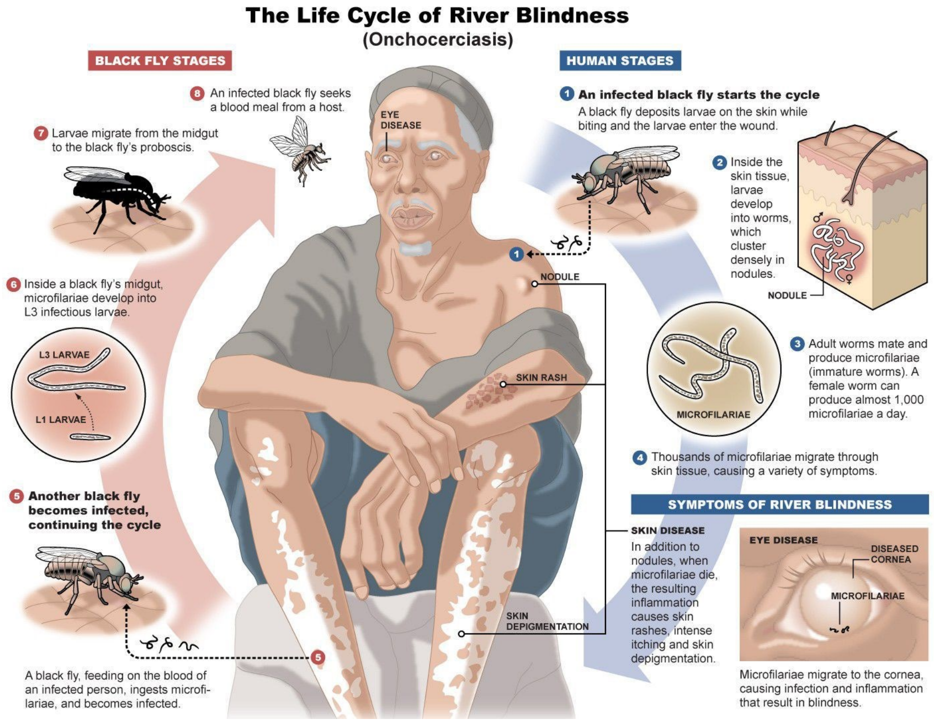
Answer:c Ergosterol as major membrane sterol

Ergosterol is a sterol found in the cell membrane of fungal cells, whereas human cells predominantly have cholesterol in their membranes.

906. A women visited tropical region of Africa and presented with new visual impairement and sensation of something moving in eye. She was bitten by black flies during her stay. She also had some subcutaneous nodules .What is the most likely causative agent?

A) Ancylostoma braziliense
B) Dracunculus medinensis
C) Loa Loa
D) Onchocerca volvulus

Answer:d Onchocerca volvulus



The Life Cycle of River Blindness
(Onchocerciasis)

BLACK FLY STAGES

⑧ An infected black fly seeks a blood meal from a host.

⑦ Larvae migrate from the midgut to the black fly's proboscis.

⑥ Inside a black fly's midgut, microfilariae develop into L3 infectious larvae.

⑤ **Another black fly becomes infected, continuing the cycle**

A black fly, feeding on the blood of an infected person, ingests microfilariae, and becomes infected.

HUMAN STAGES

① **An infected black fly starts the cycle**
A black fly deposits larvae on the skin while biting and the larvae enter the wound.

② Inside the skin tissue, larvae develop into worms, which cluster densely in nodules.

③ Adult worms mate and produce microfilariae (immature worms). A female worm can produce almost 1,000 microfilariae a day.

④ Thousands of microfilariae migrate through skin tissue, causing a variety of symptoms.

SYMPTOMS OF RIVER BLINDNESS

SKIN DISEASE
In addition to nodules, when microfilariae die, the resulting inflammation causes skin rashes, intense itching and skin depigmentation.

EYE DISEASE
Microfilariae migrate to the cornea, causing infection and inflammation that result in blindness.

907. Which of the following protozoa is transmitted primarily by motile Trophozite form?
A) Balantidium Coli
B) Entamoeba Histolytica
C) Giardia lamblia
D) Trichomonas vaginalis
Answer:d Trichomonas Vaginalis

908. Which of the following protozoan is free living and is such that its acquisition does not indicate fecal contamination?
A) Acanthamoeba
B) Dientamoeba fragilis
C) Entamoeba histolytica
D) Entamoeba coli
Answer:a Acanthamoeba

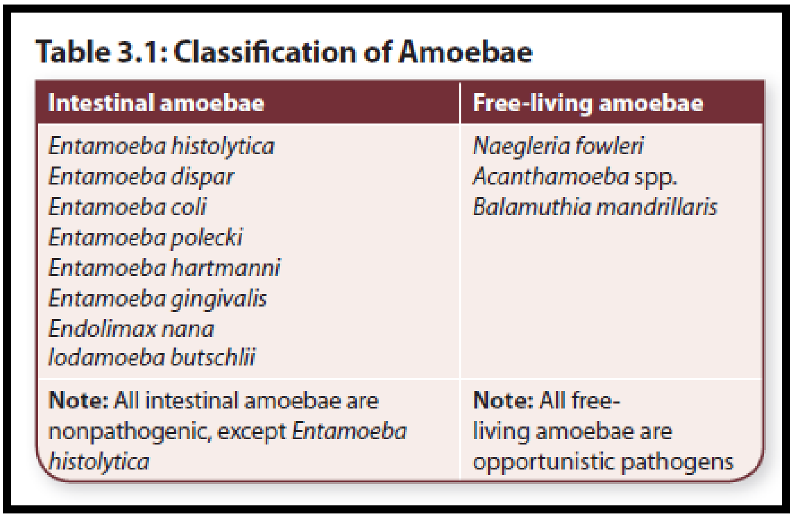


Table 3.1: Classification of Amoebae

Intestinal amoebae	Free-living amoebae
Entamoeba histolytica *Entamoeba dispar* *Entamoeba coli* *Entamoeba polecki* *Entamoeba hartmanni* *Entamoeba gingivalis* *Endolimax nana* *Iodamoeba butschlii*	*Naegleria fowleri* *Acanthamoeba* spp. *Balamuthia mandrillaris*
Note: All intestinal amoebae are nonpathogenic, except *Entamoeba histolytica*	**Note:** All free-living amoebae are opportunistic pathogens

Life Cycle

- Both trophozoites and cysts are infective.
- Human beings acquire by inhalation of cyst or trophozoite , ingestion of cysts, or through traumatized skin or eyes (Fig. 3.13).
- After inhalation of aerosol or dust containing trophozoites and cysts, the trophozoites reach the lungs and from there, they invade the central nervous system through the blood stream, producing granulomatous amoebic encephalitis **(GAE)**.

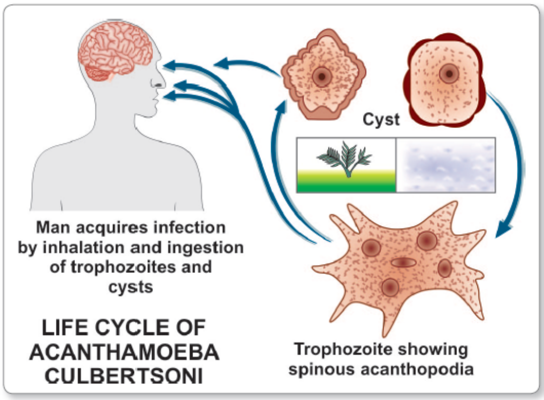

Cyst
Man acquires infection by inhalation and ingestion of trophozoites and cysts
LIFE CYCLE OF ACANTHAMOEBA CULBERTSONI
Trophozoite showing spinous acanthopodia

Fig. 3.13: Life cycle of *Acanthamoeba culbertsoni*